UNIVERSITY OF ALBERTA LIBRARY
0 1620 0984 8217

Digitized by the Internet Archive
in 2019 with funding from
University of Alberta Libraries

https://archive.org/details/bluejay531sask

SC

BLUE JAY

March 1995

Blue Jay, founded in 1942 by Isabel M. Priestly, is a journal of natural history and conservation for Saskatchewan and adjacent regions. It is published quarterly by **Nature Saskatchewan, Box 4348, Regina, Saskatchewan, S4P 3W6.**

CN ISSN 0006-5099.

Editor: J. Lynn Brown

Associate Editors: Margaret Belcher, Ed Driver, J. Bernard Gollop, Wayne C. Harris, Ronald Hooper, Robert W. Nero, Carol A. Scott, Vernon L. Harms

EDITORIAL INFORMATION: All items for publication should be addressed to the editor, care of Nature Saskatchewan (see address at top). Deadlines for each issue are two months prior to issue, i.e. 1 January, 1 April, 1 July, and 1 October. Please include author's telephone number for editorial contact, if necessary. Typewritten manuscripts should be double spaced and submitted in duplicate. Manuscripts may be submitted in text file form on IBM 5.25 inch DSDD diskettes, which will be returned to authors when copies have been made. The editor uses Word Perfect 5.1 and can accept manuscripts in ASCII format also. Please include a hard copy. For further assistance see "Guidelines for Authors," *Blue Jay* 50: 126-128, or contact the editor. *Blue Jay* is abstracted by BIOSIS.

Common names are used for species where possible. Bird names follow the 1983 revision of the *American Ornithologists' Union Check-list*. Mammals are from Banfield's *The Mammals of Canada* (1974). Since insect and plant names are not standardized, scientific names are included, with authorities where deemed necessary.

Photographs submitted should be on glossy paper. Nature Saskatchewan does not guarantee that any photographic submissions will be returned. Send a copy, unless you don't want to save the original. Prints will be returned on request. Deadlines for photographic materials are one month prior to issue, i.e. 1 February, 1 May, 1 August, and 1 November.

Any material printed for the *Blue Jay* may be reproduced without permission. Credit lines are appreciated. Use of photographs and poetry requires written permission from the photographer/author.

ADVERTISING: Advertising rates may be obtained from Nature Saskatchewan (address at top).

REPRINTS: A maximum of five reprints of an article are available to authors for a charge of $0.25 each. Contributors wishing a few extra copies of the current issue may get them at cost. Requests for reprints or extra copies should be made to the editor when the material is submitted for publication.

SUBSCRIPTION: Send all renewals, new memberships and correspondence concerning changes of address to Nature Saskatchewan (address at top). Renewal form on last page.

Bulk orders (minimum of five copies to one address) are available to society members and educational institutions at the rate of $15 for the first subscription and $13 for each additional one. Outside Canada, fees are $18. We do not collect GST on memberships.

Cover: Least Chipmunk. Photo by George Tosh.

Published by the Canadian Plains Research Center, University of Regina. Printed by Merit Printing, Regina, Saskatchewan, on 10% recycled paper.

THIS ORGANIZATION RECEIVES FUNDING FROM

Saskatchewan
LOTTERIES
LOTTERY TICKET CENTRE

Blue Jay

Vol. 53 No.1 March 1995 1-60

Conservation

AGRICULTURAL POLICY REVIEW PART 4: SASKATCHEWAN'S CROWN LAND POLICIES. *Fred Thornton, Joce Bowman and David Struthers* 1

Insects

SULPHUR BUTTERFLIES OF THE *Colias alexandra* COMPLEX IN ALBERTA. *Norbert G. Kondla* 15
BUTTERFLIES AND SKIPPERS OF PLATEAU MOUNTAIN, ALBERTA. *Harold W. Pinel and Norbert G. Kondla* 28

Birds

HOUSE FINCH AT ABERNETHY IN 1990. Ronald A. Bittner 42
AVIAN BOTULISM WITHIN EYEBROW MARSH, SASKATCHEWAN: 1988-1992. *Lyle W. Saigeon* 44
THE GOPHER-CROW FIGHT. *Keith Barr* 49
RAMBLINGS ON VS SCIENTIFIC STUDY. *Keith Barr* 50
THREE YEARS OF MISTNETTING BIRDS IN THE EASTERN QU'APPELLE VALLEY. *John Pollock* 53
SNOWY OWL PREDATION ON A NORTHERN POCKET GOPHER: EVIDENCE OF NOCTURNAL FORAGING? *Terry M. Breen-Smith and Paul C. James* 58

Mammals

CONFESSION. *Keith Barr* 60
A CLOSE ENCOUNTER OF THREE KINDS. *Keith Barr* 61
REHABILITATED RED FOXES AND COYOTES. *Terry and Randy Langelier* 63

Poetry

MARIGOLD HEAD. *Jean MacKenzie* 66
CLEVER JILL. *Jean MacKenzie* 66

Nature Library

WINGS OVER THE PRAIRIE. *Reviewed by C. Stuart Houston* 67
SHADOWBIRDS — A QUEST FOR RAILS. *Reviewed by Mabel Charlton* 67
EDITORIAL ii

UNIVERSITY OF ALBERTA
APR - 6 1995
LIBRARY

EDITORIAL

Many faithful *Blue Jay* readers will be surprised that the Christmas Bird and Mammal Counts for 1994 do not appear in this issue. Fear not, you will find them in the upcoming June 1995 issue. The main reason for the change is that getting the count information in time for the March issue is difficult and frequently delays printing of the March issue. In an effort to have this issue out in good time, I have decided to make this move, one which I know will be unpopular with some people.

For personal reasons, I am resigning my position as *Blue Jay* editor. The new editor has not been chosen at the time of writing. I hope whoever replaces me will find this demanding volunteer position as interesting and educational as I have.

J. Lynn Brown

Have You Renewed Your

Nature Saskatchewan

Membership for 1995?

AGRICULTURAL POLICY REVIEW PART 4: SASKATCHEWAN'S CROWN LAND POLICIES

FRED THORNTON, JOCE BOWMAN, and DAVID STRUTHERS, Western Resource Management Associates, Box 4-B, Site 2, Yorkton, Saskatchewan. S3N 2V4

The Canadian prairie is fast becoming a relic. In only 100 years it has been so radically transformed by human activity that it is now considered to be one of the most endangered natural regions in Canada. Native prairie is crucial to the existence of most prairie wildlife for all, or some portion, of their life cycles. Not surprisingly, many wildlife species that are dependent on native prairie habitat are also in decline. More than one-third of the birds and mammals designated on the 1988 list of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) are from the prairie provinces.

More than one third of the birds and mammals designated on the 1988 list of COSEWIC are from the prairie provinces.

There are four grassland types within prairie Canada: tall grass prairie, mixed grass prairie, fescue prairie, and aspen parkland (mixture of fescue grassland and aspen grove). The exact area of each grassland eco-type remaining in Saskatchewan is unknown; however, using Canadian Wheat Board leased and deeded rangeland statistics and adding acreage for Provincial and Prairie Farm Rehabilitation Administration (PFRA) community pastures, Gayton estimates that approximately 11.3 million acres of native rangeland remain in Saskatchewan.[2] This represents only 17% of the province's original area of grassland. The preponderance of native rangeland is underlaid by soils of marginal productivity. These native areas are unevenly distributed, with the greatest concentration situated in the southwestern portion of the province, and most of the areas have experienced varying degrees of degradation to native communities through exposure to perennial overgrazing.

The Saskatchewan government, through Saskatchewan Rural Development (SRD), owns and administers over 9 million acres of Crown land designated as "agricultural." Included in those 9 million acres are over 7 million acres of grazing land (pers. comm., SRD-Lands). SRD-Lands estimates that more than 95% of their grazing lands are native range. The PFRA holds title to over 1.3 million acres of Saskatchewan grazing land. They estimate that

Prairie Falcon *Wayne Lynch*

80% (1.0 million acres) of their titled acres remain as native rangeland. Considering the figures, SRD and the PFRA together administer and manage approximately 68% of Saskatchewan's remaining native grasslands.

Not only are provincial and federal governments the major landlords of Saskatchewan's native range, they own the only large contiguous blocks of native grassland that exist in Saskatchewan. These vital areas act as habitat reservoirs and are essential for the maintenance of many wild species. Privately owned native prairie is highly fragmented, existing as a patchwork within a matrix of cultivated land. Given the obligate dependency of most of Saskatchewan's wildlife (particularly endangered species such as the Burrowing Owl, Ferruginous Hawk, Sage Grouse, etc.) on native grasslands, and with such vital areas of native prairie under Crown control, policy governing the management and disposition of "agricultural" Crown land can have a major effect on their health and welfare.

Wildlife Habitat Protection Act (WHPA) The WHPA designated approximately 3.4 million acres of agricultural Crown land as Wildlife Habitat Land (WHL). The Act and its regulations ensure that designated land cannot be sold by the government and that surface alterations do not take place at the expense of wildlife. Crown lands not eligible for inclusion in the WHPA include PFRA pastures, Saskatchewan Land Bank land, road allowances, national parks, Indian reservations, provincial forests, and provincial parks.

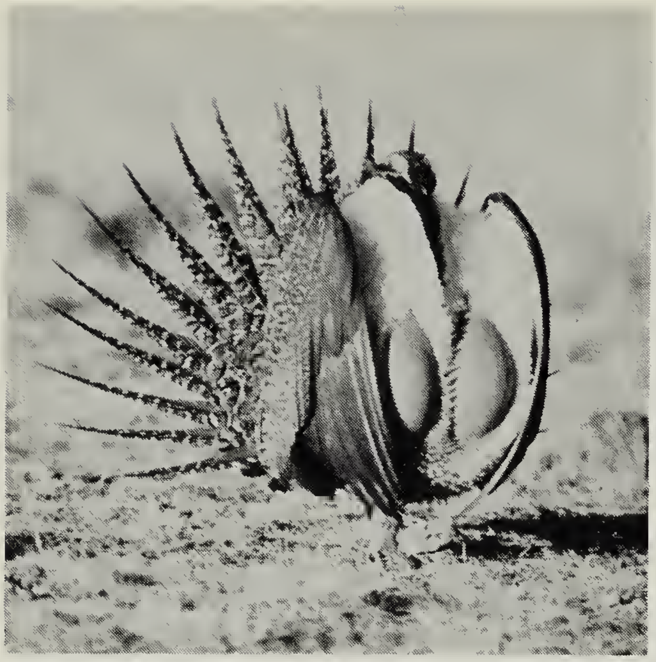
WHL was selected on the basis of terrestrial Wildlife Habitat Inventories conducted by Saskatchewan Natural Resources (now called Saskatchewan Environment and Resource Management [SERM]) during the late 1970s and early 1980s. Eligible Crown lands falling within these

Young Ferruginous Hawks in a nest built on the ground in the Frenchman River Valley *Gary W. Seib*

areas was recommended for inclusion in the WHPA. These inventories catalogued the best habitat for terrestrial game species that existed in the province. The thrust of the selection process was aimed at White-tailed Deer, Mule Deer, Pronghorn, and Sharp-tailed Grouse. Most of the area represented by the inventory is considered to be essential wintering habitat for these species. In reality, much additional habitat is required for the maintenance of healthy wildlife populations (pers. comm., SERM-Wildlife Branch). Lands selected for their importance to rare and endangered species represent less than 4% of the total designated acreage. These lands are classified as "super critical," designation was based on their importance to Sage Grouse, Prairie Falcon, and Golden Eagle.[4] Additional lands for rare and endangered species, such as Burrowing Owl, Piping Plover, Ferruginous Hawk, and Swift Fox, were included in the most recent additions to the WHPA (pers. comm., SERM-Wildlife Branch).

Enterprises allowed on WHL include exploration for, and extraction of, resources such as oil and natural gas; maintenance related to existing electrical transmission, radio, and telecommunication lines plus provincial highways and municipal grid road; grazing of livestock and haying; and agricultural cultivation of land already cultivated prior to inclusion in the WHPA. No consultation with SERM biologists is required in conjunction with authorizing the aforementioned uses. Saskatchewan Rural Development District Lands agrologists are responsible for approving and authorizing all the permitted activities on WHL. The Act and its regulations do not change the terms and conditions of agricultural leases as issued under the Provincial Lands Act.[4]

On lands designated as super



Sage Grouse *Gary W. Seib*

critical, agricultural activities associated with grazing, haying, and permitted cultivation are allowed with no restrictions or conditions. Activities associated with the exploration and extraction of oil and gas are allowed, but SRD-Lands must notify petroleum companies that SERM-Wildlife Branch approval is required prior to initiation of work. Industry is then expected to comply with several conditions associated with minimizing the disturbance their activities may cause to breeding endangered wildlife species.

Policy and Management of Saskatchewan's Provincial Agricultural Crown Land SRD-Lands is responsible for the administration of agricultural Crown land in the province. According to the SRD-Lands Administration Manual, their mission is to "enhance the economy of the province and to serve the public interests through responsible agricultural Crown land management and the promotion of proper land use." Enhancement of the provincial economy is achieved through the lease and sale of Crown lands and the operation of provincial community pastures.

SRD-Lands Policy and Program Development section is responsible for reviewing legislation, evaluating policies and programs, and generating new research from which rangeland management programs can be generated. Personnel are initially organized in four regions that contain 18 districts. Most decisions affecting the administration of Crown lands have been decentralized to this level. District Lands agrologists are responsible for the administration of leased lands and community pastures within their districts. Range agrologists, working with the District Lands agrologists, monitor range conditions, conduct research in rangeland agrology, and work with SRD clients and the general public on rangeland development (pers. comm., SRD-Lands).

There are two areas within SRD-Lands' jurisdiction that can potentially impact on native grassland habitat: Crown land sales and the management of grazing leases, hay leases, and provincial community and cooperative pastures.

Crown Land Sales The purpose of Crown land sales is "to sell saleable leased agricultural Crown land to leaseholders to improve the equity base for farm operation and agriculture in Saskatchewan."[7] Crown land sales policy is currently being reviewed by the provincial government. The controversial "rent-to-own" program has been discontinued and tender sales are on hold. The only Crown land currently eligible for sale is available at market value to those individuals holding long-term leases. The lessee follows an application procedure that includes approval from the affected rural municipality (RM) and the appropriate SRD-Lands District Lands agrologist. If there are no tax arrears or sales restrictions (e.g., WHL lands) sale of the land can proceed. Land may be sold to existing grazing cooperatives/ associations providing that a majority of the members have voted in favour of the purchase. Disposition of land amongst the members is the responsibility of the cooperative/association.

Approximately 3.26 million acres of leased Crown land (grazing and cultivated) is eligible for sale to lessees (pers. comm., SRD-Lands). Excluding the 1 million acres of cultivation leases, approximately 2.26 million acres of grazing land would be eligible for sale. SRD-Lands estimates 95% of their grazing lands are native ranges; therefore, approximately 2.15 million acres of native habitat remains eligible for sale. Privately owned native grassland has been proven vulnerable by a study done in southwestern Saskatchewan which found that, between 1980 and 1990, 37% of Crown grassland sold to private interests was cultivated.[9]

Management of Crown Lands Provincial lands are leased "to enhance the viability of farms and ranches by leasing lands reserved for multiple-use and/or future higher economic use." Provincial lands can be leased to individuals, corporations, or partnerships.

Grazing Leases SRD-Lands determines carrying capacities for range sites across the province and applies them to individual and cooperative grazing leases. Carrying capacities are defined in the Lands Act regulations as: "the number of head of cattle which may be pastured upon a quarter section of grazing land for a grazing season of seven consecutive months of average precipitation without causing deterioration in forage production." These values do not fluctuate annually (pers. comm., SRD-Lands).

Stocking rate; seed mixtures for rejuvenation of tame forage, pasture development, and marginal land reclamation; grazing dates; and grazing management systems can be recommended by SRD-Lands, but lessees are not obligated to follow these recommendations. The most common grazing system implemented on private and cooperative grazing leases is season-long because it is simplest and management requirements are minimal. Season-long continuous grazing does little to control livestock distribution or eliminate localized overgrazing. Many documented cases of range deterioration have been attributed to the long-term use of continuous grazing. SRD-Lands has the authority to force patrons to practice sound pasture management but they do not. Currently, SRD-lands is trying to work with lessees and cooperatives to improve management practices, but there is strong resistance to change (pers. comm., SRD-Lands).

In the opinion of surveyed range ecologists outside the civil service range conditions on Crown grazing leases across Saskatchewan rated as poor to fair. Range condition is the present state of the vegetation compared with the climax or original plant community on this site.[2] Climax is defined as the highest ecological level of plant community development capable for perpetuation under prevailing climatic and soil conditions (pers. comm., PFRA-Pasture Planning Service [PPS]). Range in poor condition has only 0-25% of the climax vegetation present on the site, while range in fair condition has 26-50% of the climax vegetation present.

Annual cultivation of a grazing lease is permitted only with the prior written consent of the Minister of Agriculture. This approval is requested following a field inspection by the District Lands agrologist. If soils are marginal (e.g., saline, alkaline, highly erodible or rocky), or if the parcel is protected under the WHPA, agrologists would recommend that the parcel remain in native vegetation. If, however, the parcel supports "a good stand of native grass" or is a "bush quarter overlaying good clay loam," and is not within the bounds of the WHPA, the request would be granted by the agrologist with no further approvals required. Agrologists base their decisions on their opinion of the highest and best agricultural use of the land. The conversion of a grazing lease to a cultivation lease under SRD-Lands approval is considered permanent as SRD-Lands will not approve its conversion back to a grazing lease. Prior to 1988, the provincial government paid development costs for conversions and, as a result, they were quite common. These costs are now the responsibility of the lessees, consequently requests are rare (pers. comm., SRD-Lands).

The Provincial Land Improvement Policy In March 1991, SRD-Lands introduced the Provincial Land Improvement Policy to "assist lessees of agricultural Crown land to improve the productivity of their leases."[8] Under this policy, lessees can receive financial assistance for range improvement and range development, and lease rate adjustments for rejuvenating tame forage stand and establishing perennial forages on marginal land.

a) Range Improvement: In order to be eligible for range improvement assistance, lessees must have their grazing lease inspected by an SRD-Lands agrologist. If the range is in poor condition the lessee may apply. The application must include a detailed aerial photograph showing fences, watering sites, corrals, etc.. Once the application is accepted, the lessee is required to enter into a Range Improvement Agreement (not less that five years and not more than ten) with SRD-Lands that stipulates several restrictions on the grazing regime. These restrictions usually include number of cattle grazing, length of grazing season, the format for the required annual grazing records, and any other measures required to hasten the recovery rate of the range (e.g., changes in paddock size, location and number of watering sites, etc.).[8]

Lessees who enter into range improvement agreements with SRD-Lands will have lease rates reduced to the average rate for range in similar condition. This reflects actual stocking rate as opposed to potential stocking rate. This policy rewards lessees who mismanage their Crown land by reducing their lease rates as part of the rejuvenation assistance. This is unfair to lessees who strive to maintain the productivity of their leased land as their rates will remain the same or rise.

b) Range Development: This improvement option refers to the conversion of native range to tame pasture.[8] To qualify for this option, an SRD-Lands agrologist must conduct a field assessment of the range to determine if conversion is the best agricultural use of the land. Areas within the site that are suited for improvement are identified based on parameters such as topography, soil structure and texture, stoniness, and other factors. Once approval has been granted, the lessee must agree to a development plan and complete a Land Development Contract with SRD-Lands prior to work being initiated. Lessees develop leased land at their own expense. However, in consideration for their costs, rental rate increases that would be applied to the lease, because of its increased productivity, would not be charged until six or eight years after the conversion.

Coupland suggests that the conversion of native grassland to tame (exotic) grasses has been done without consideration for the long-term consequences.[1] He found no empirical evidence supporting claims that exotic grasses outperform native species with regard to yield or forage nutrient quality.

c) Rejuvenation of Tame Forages: To qualify for this option, the lessee must obtain permission from an SRD-Lands agrologist. The area broken must be reseeded to a perennial forage within four years. To allow the lease to recover some of the development costs, annual crops, including a nurse crop, may be grown on the broken area for up to three years without a cultivation surcharge.[5]

d) Marginal Land Protection: Perennial forages may be grown on lands designated as cultivated lands in a lease agreement. Lease rates will be reduced to reflect the change in production if an SRD-Lands agrologist determines that the land is marginal for annual cultivation. Rental adjustments will occur the year the request is made, but will not be retroactive to the original date of conversion.[5]

Hay Leases and Permits Provincial lands may be leased for harvesting native hay or for the production of perennial tame hay crops. Annual hay permits are also issued on vacant Crown lands for harvesting native or tame hay. Lessees and permittees are required to harvest the quantity of hay authorized in a "good and husband-like manner and without waste."

According to SRD-Lands, permits are predominantly issued on native haylands, while leases are issued on a mixture of native, tame, and irrigated lands. There are no data established for hay cutting. Hay can be harvested whenever the lessee chooses. Hay-cutting operations in Saskatchewan disrupt native wildlife during their sensitive reproductive period, especially ground-nesting birds whose normal hatching period usually coincides with the prime cutting period. Nests established in cut areas can be destroyed by haying machinery and there is a high probability the incubating female may be killed or injured as well. The one exception to this is on Crown lands adjacent to the Quill Lakes, where annual permits only allow haying after 15 July to protect nesting waterfowl.

Provincial Community Pastures The intent of the Provincial Pasture Program is to provide community grazing services to patrons' livestock that have been accepted under the Provincial Allocation Policy. Community pastures are managed by pasture managers that are under the direct supervision of SRD-Lands agrologists.[6]

There is no policy formulated for the management of provincial community pastures. Management philosophy has been "to maximize grazing for beef production while minimizing ranges damage." SRD-Lands has just recently begun to gather range trend information within their community pastures, as a method of evaluating the effectiveness of range management systems. Range agrologists are recording livestock weights at the beginning and end of each grazing season, setting up enclosures, taking forage clippings to measure productivity, and completing annual reports cards on range conditions (pers. comm., SRD-Lands).

Provincial pastures are currently in transition from predominantly season-long (continuous) grazing systems to more intensively managed rotational systems. Today, there are no pastures that operate under a season-long grazing regime. Every pasture manager moves livestock at least twice during the grazing season. The goal of community pasture systems is to operate pastures as demonstration sites of sound management principles. Many pasture patrons maintain additional private and leased pasture and it is hoped that management practices demonstrated on community pastures will carry over to such lands (pers. comm., SRD-Lands).

Development plans for provincial community pastures are not reviewed by any outside agency to assess pasture environmental impacts, however, range sites scheduled for development are first checked for any reservations, such as inclusion in the WHPA. SRD-Lands agrologists, range agrologists, and pasture managers develop plans, and if funding is available the plans can proceed. Currently, funding for pasture conversion and/or rejuvenation is low, however, if funding were to improve, rejuvenation of tame paddocks would be a priority. Brush control is usually achieved through burning. Areas slated for burning are typically rested for a full grazing season and are then burned the following spring. The use of herbicides is diminishing because of low success rates and high associated costs (pers. comm., SRD-Lands).

Stocking rates (the number of animals on a unit of land during a particular period) are based on the amount of forage consumed by a 1,000-lb. cow with or without calf. The average weight of range cows in Saskatchewan today is approximately 1,200 to 1,300 lbs.. There is a direct correlation between the size of the animal and the amount of forage consumed. Some provincial pasture managers may make some downward adjustments in stocking rates to adjust for increased cattle weights, but more commonly adjustments are not made since pasture patrons often react negatively to decreases in stocking rates (pers. comm., SRD-Lands). Using corrected 1,000-lb. animal weights for carrying capacity and stocking rate calculations can underestimate forage consumption by at least 20%.[3]

Wildlife are not formally recognized in provincial community pasture policy. Wildlife utilization of forage is not factored in when carrying capacities and stocking rates are determined. Wildlife sensitive time periods and/or areas are not considered in planning cattle movements. Generally, riparian areas are not managed as separate units within range management plans (pers. comm., SRD-Lands).

Range ecologists outside of the civil service were contacted to assess average range conditions on provincial community pastures. Seventy-five percent were rated as poor to fair and 25% were rated as good to excellent. Range condition was considered to be very dependent on individual pasture managers. In general, southern pastures were rated better than those in the north. This was attributed to southern drought conditions forcing a more conservative use of the resource.

PFRA Community Pasture Program The PFRA is a branch of Agriculture Canada working in the prairie provinces. The Community Pasture Program began in 1937 as a method of dealing with the vast acreage of farmland abandoned during the drought of the 1930s. Today, there are 87 community pastures across the prairies. Saskatchewan has 62 PFRA community pastures covering approximately 1.8 million acres. According to the PFRA, approximately 80% of their 1.2 million titled acres remain as native range, much of which is considered critical habitat for wildlife.

The PFRA Community Pasture Program does not have written policies governing pasture management, development, or multiple land use, however, the program does have four objectives:

1) to protect marginal soils from erosion by maintaining permanent cover on these lands;

2) to help producers with small farms by allowing them to use the pastures for summer grazing;

3) to encourage high-quality, long-term cattle production by providing a breeding service using good bulls; and

4) to manage the rangeland resources to ensure a healthy relationship between soil, plants, and animals.

PFRA Range Management The PFRA's unwritten goal for range management is to strive to maintain 65% to 75% of the range in the climax community (good to excellent range conditions).

Range management biologists base carrying capacities on long-term precipitation rates, soil types, plant communities, and the forage intake requirements of a 1,000-lb. cow. Stocking rates in PFRA pastures are almost always set below carrying capacities. Stocking rates use the 1,000-lb. cow as the standard, but are multiplied by a correction factor of 1.4 to account for today's larger cow size. The rates vary from year to year because of fluctuations in forage supply, mainly due to the previous year's grazing history and the amount and distribution of seasonal precipitation. Stocking rates are set to try to maintain a 40% forage carryover at the end of grazing season (pers. comm., PFRA-PPS).

Grazing systems manipulate grazing in a planned manner, optimizing livestock production through correct stocking rates and forage use levels. In PFRA pastures, the type of grazing system employed varies according to the resources available within, and the management goals of, individual pastures. The most commonly used grazing system is complimentary (graze seeded pasture during the vulnerable spring period while deferring native range for summer grazing), followed by deferred rotation (defer grazing on several pasture units in a planned rotation), and finally rest-rotation (requires four or more paddocks and each year one is given total rest while other fields are grazed in rotation). Season-long or continuous grazing is still used on PFRA pastures. The extent of its use could not be ascertained, but it was implied that the implementation of grazing systems was difficult because of resistance to change (pers. comm., PFRA-PPS).

The primary use of PFRA pastures is agricultural therefore, and multiple-use plans must mesh with that priority. The PFRA's leased agreement with the provincial government stipulates that all provincial Crown lands within PFRA pasture boundaries must be used for agricultural purposes. If a portion of a pasture is removed from agricultural use, control and management of that area will automatically revert back to the province. Consequently, the PFRA will not specifically set aside any area within a pasture for an alterative use (pers. comm., PFRA-PPS).

The PFRA is an active participant in the Swift Fox release program and has modified development plans (halt pasture conversion and/or rejuvenation) in relevant pastures to protect fox dens. Sage Grouse leks within pastures have been identified and pasture development plans take such areas into consideration. In pastures in the Weyburn area, fenced enclosures have been placed around trees as nest sites by Ferruginous Hawks. The PFRA, with guidance from Ducks Unlimited, has completed inventories and begun to initiate management recommendations to enhance waterfowl production on pastures within priority areas of the North American Waterfowl Management Plan. Grazing systems that accommodate nesting waterfowl habitat requirements are currently being implemented in Mount Hope/ Prairie Rose and Monet PFRA pastures. The PFRA is not an active participant in the Burrowing Owl Program, but there are a significant number of nesting burrows within pastures and the PFRA restricts pesticide use in areas where they have been identified (pers. comm., PFRA-PPS).

Forage use by wildlife is not considered when carrying capacities and stocking rates are determined. However, the PFRA recognizes that wildlife utilize their pastures and suggest that the 40% carryover is primarily for wildlife use (pers. comm., PFRA-PPS). According to PFRA inventories, riparian areas represent less than 2.4% of their total pasture area, therefore an emphasis has not been placed on their management. Grazing systems that provide livestock control in terms of both numbers and duration have been implemented in riparian areas on a limited scale (pers. comm., PFRA-PPS). According to wildlife biologists and range ecologists outside the civil service, riparian areas comprise a considerably larger area within PFRA pastures than indicated by PFRA inventories.

The PFRA's current development plans are not directed towards the large scale conversion of native grasslands to tame forage. During the mid- to late 1970s, the PFRA undertook a fairly extensive program of converting native range to tame pasture (crested wheatgrass was the favoured replacement). The end result of this conversion program was a number of unmanageable plots within the confines of larger paddocks. Future development will be directed at increasing the management capabilities of these plots, either through limited consolidation of the tame plots and fencing, or by hastening their return to native vegetation (pers. comm., PFRA-PPS).

The PFRA develops five-year plans for each community pasture. Included in these plans are new fence locations, water development sites, paddocks designated for improvement/development, and sites selected for woody growth control. The PFRA's range ecologists review these plans to ensure the integrity of the range is maintained. Since 1987, pasture plans have also been reviewed by SERM-Wildlife Branch. The PFRA considers this review to be an environmental assessment, in which SERM is to identify development plans that could negatively impact on wildlife and the environment. The PFRA's pasture development plans must receive SERM approval prior to their implementation regardless of whether they will affect titled or provincial Crown lease land (pers. comm., PFRA-PPS).

Once pasture development plans have received PFRA internal approval, they are forwarded to the SERM-Wildlife Branch. Plans are then distributed to the relevant regional wildlife biologist. These biologists concentrate on three types of developments in their assessment of PFRA pasture plans: new fence line construction, conversion of native range to tame pasture, and woody growth control. New fence line construction going through forested areas is flagged to ensure minimal clearing occurs. The conversion of native range to tame pasture is closely scrutinized. Critical terrestrial habitat maps are overlaid to ensure that the area to be converted does not include critical habitat. In grasslands, the major area of concern lies with Sharp-tailed and/or Sage Grouse habitats and wintering habitat of Pronghorn and Mule Deer. Also flagged are potential developments that could interfere with Ferruginous Hawk, Golden Eagle, and Prairie Falcon nesting habitat. Burrowing Owl habitat does not receive much consideration in this review because the data base on this species within PFRA pastures is poor. In the parkland, brush clearing proposals are carefully reviewed. In this regard, species of concern include White-tailed Deer, and Sharp-tailed and Ruffed Grouse (pers. comm., SERM-Wildlife Branch). Regional wildlife biologists do not comment on the effects of grazing management on wildlife habitat.

Currently the Canadian Wildlife Service (CWS) is not involved in reviewing the PFRA five-year pasture plans. Over the past 25 years, the CWS has tried to establish a cooperative agreement with the PFRA that would formalize CWS's input into pasture development and management, but this process has met with little success. The PFRA seeks CWS involvement on an individual pasture basis only (pers. comm., CWS).

Range ecologists outside of the civil service were asked to assess range conditions on PFRA pastures. The pastures were ranked the same as provincial community pastures with 75% poor to fair and 25% good to excellent. Assessors felt range condition was very much dependent on individual pasture managers.

Discussion There is a problem with society's current view of native prairie, which is reflected in descriptions such as "unimproved land" or "wasteland." Breaking native range and seeding tame grass with legume species or annual crops is considered "improvement" or "development." We must begin to view native prairie in a new way, a way that values its richness and diversity as a foundation of sustainable economic activities.

The World Conservation Strategy identified the Canadian prairies as an area of international significance for conservation. The Prairie Conservation Action Plan considers: "Every remaining prairie wetland as precious, each aspen forest as critical, and every tract of native grassland a national treasure."[10]

In Saskatchewan, the geographic area occupied by native prairie has shrunk to 17% of its original area and native vegetation communities associated with these remnants have usually been denatured by perennial overgrazing. Together, the federal and provincial governments own, administer, and manage approximately 68% of this vanishing resource. Numerous rare and endangered species of fauna and flora depend upon native grasslands for their continued survival. There is an obligation for government to manage this resource for all of Saskatchewan, not solely for Saskatchewan's livestock producers. A Statistics Canada survey from 1981 showed that over 82% of Canadians expressed support for preserving endangered species. The conservation and sound management of Saskatchewan's native Crown-owned grasslands would be a major step towards this.

The intent of Saskatchewan's WHPA is to protect that portion of the provincial agricultural Crown land that is considered critical to maintenance of terrestrial wildlife populations. To date, 3.4 million acres have been enrolled under the protection of the WHPA. According to SRD-Lands, they administer over 7 million acres of grazing land of which an estimated 95% (6.65 million acres) remains as native range. Therefore, the WHPA protects approximately 51% of the province's native agricultural Crown land from sale and alteration.

Unfortunately, the WHPA has little influence over the ecological health of these protected habitats. In this regard we must depend on the stewardship of the administrators, managers and clients of SRD-Lands. The WHPA is a reality only because it does not infringe upon grazing and haying rights of lease holders. If the WHPA had attempted to adjust farming/ranching activities to accommodate wildlife sensitive periods and habitats it would likely have never received legislative approval.

Loss of native habitat is one of the most significant threats to wildlife species and ecosystems. The Prairie Conservation Action Plan calls for governments to more explicitly incorporate conservation of native prairie into their programs. This is reiterated in Saskatchewan's Round Table on the Environment and Economy report "Conservation Strategy for Sustainable Development in Saskatchewan" which was accepted by the provincial government in June 1992.[5,10] This report recommends that: "Governments and agricultural producers develop program and policies to ensure the sustainable use of grazing resources."

Toward that end it advises:

1) management plans should be developed for all Crown grazing lands to ensure sustainable use of grazing resources and to achieve multiple land use; and

2) all remaining native rangeland should be managed to maintain Saskatchewan's biological diversity. Damaged areas should be restored to productive native rangelands.

Management to maintain biodiversity on Saskatchewan's native range requires more than just preservation. The term wildlife must be expanded to include more than deer, antelope, grouse, and ducks. It should encompass all of our native flora and fauna. Multiple-use management must include more than altering development plans and fencing nest sites. Native range must be catalogued in inventories and mapped. Managers must be educated as to the plant and animal species present within their pastures and the habitat requirements specific to them. The provision of moderately grazed range will not solve the "wildlife problem." Grassland wildlife species also evolved under a grazing regime and there are certain species, Burrowing Owls for instance, that prefer nesting in heavily grazed areas. Livestock movements can be managed to create a diversity of grassland habitats while maintaining optimal livestock production.

Policy governing the management of federal and provincial grazing lands should be rewritten to reflect public rather than solely agricultural interests. Provincial and PFRA pastures should continue to provide supervised grazing programs, but management should be expanded to provide an optimal balance of conservation, public access, and other land uses. The province of Alberta is currently managing its public grazing reserves under such a policy. The reserves offer a variety of recreational opportunities including hunting, hiking, trail riding, camping, sightseeing, cross-country skiing, and snowmobiling. Maps are available to assist recreational users by showing access and designated travel routes. These designated routes give the public optimal access to the reserves while minimizing both damage to grazing lands and conflicts with other users. Adoption of a similar policy in Saskatchewan would provide opportunities for all its people to enjoy true economic and social benefits from grazing and other uses of our Crown lands.

There is a problem with society's view of native prairie, reflected in descriptions such as "unimproved land" or "wasteland."

In order to achieve true multiple-use and maximum biodiversity on Saskatchewan's Crown grazing lands, the PFRA and SRD-Lands will need to form partnerships with ranchers, other government agencies, conservation organizations, and the public. Committees composed of representatives from such groups should review all pasture development and management plans prior to implementation. If we work together we can achieve the far-reaching benefits of soil and water conservation, a healthy livestock industry, environmental sustainability, and multiple resource use.

This article is published under the auspices of the Saskatchewan Natural History Society-Endangered Species and Spaces Committee and is the fourth in a four-part series on the effects of agricultural policy in Saskatchewan.

1. COUPLAND, R.T. 1977. Concerns respecting the "improvement" of rangeland by use of exotic grasses. Paper presented at symposium "Classification and Utilization of Grazing Lands in Southern Saskatchewan," sponsored by the Ecologics and Land Resources Research Coordinating Group of the College of Agriculture, Univ. of Saskatchewan. 14 pp.
2. GAYTON, D.V. 1991. Grazing pressure on Saskatchewan rangelands. *Rangelands* 13:107-108.
3. PYLE, W. 1990. Managing Saskatchewan rangeland. New Pasture and Grazing Technologies Project. 118 pp.
4. SASKATCHEWAN ENVIRONMENT AND RESOURCE MANAGEMENT. 1990. Policy and procedure for "The

Critical Wildlife Habitat Protection Act" lands administration (draft). Government of Saskatchewan. 31 pp.

5. SASKATCHEWAN ROUND TABLE ON ENVIRONMENT AND ECONOMY. 1991. Conservation strategy for sustainable development in Saskatchewan (draft). Saskatchewan Round Table Secretariat, Regina. 44 p.

6. SASKATCHEWAN RURAL DEVELOPMENT. 1989. Provincial land lease allocation policy. Government of Saskatchewan. 6 pp.

7. ——. 1991a. Provincial lands sales to lessees. Government of Saskatchewan. 4 pp.

8. ——. 1991b. Provincial land improvement policy. Government of Saskatchewan. 3 pp.

9. WESTERN RESOURCES MANAGEMENT ASSOCIATES. 1992. Landscape ecology: a management approach for the Sweetgrass-Frenchman agro-ecological area. Agriculture Canada — Prairie Farm Rehabilitation Administration. 64 pp.

10. WORLD WILDLIFE FUND. 1989. Prairie Conservation Action Plan. World Wildlife Fund, Canada. Toronto. 38 pp.

11. WROE, R.A., S. SMOLIAK, B.W. ADAMS, W.D. WILMS, and M.L. ANDERSON. 1988. Guide to range condition and stocking rates of Alberta grasslands, 1988. Alberta Forestry, Lands, and Wildlife, Public Lands Division. 33 pp.

Eastern Screech Owl *Tim Garton*

INSECTS

SULPHUR BUTTERFLIES OF THE *Colias alexandra* COMPLEX IN ALBERTA

NORBERT G. KONDLA, Box 762, McBride, British Columbia. V0J 2E0

The *Colias alexandra* complex consists of butterfly populations that are widely distributed in western North America (see Ferris or Scott for a range map).[23,53] A substantial literature has developed on this insect and the various taxa that have been treated as part of this complex in the contemporary literature have been the subject of "taxonomic football." Ferris provides a synonymy.[23] The purpose of this paper is to review what has been published about this complex in Alberta, describe the situation that actually exists in Alberta, and present an argument for recognizing *Colias alexandra* (Queen Alexandra Sulphur) and *Colias christina* (Christina Sulphur) as distinct species. The name *Colias alexandra* is used here in the qualified sense of Kondla as the best name available.[36]

> ***"one would be successful if they attached the name* alexandra *to a yellow male, flipped a coin and called a yellow/orange or mostly orange male* astraea, christina *or* krauthii, *and threw a planning dart at a female and called it a* Colias *species unknown."***

Historical Taxonomy Summary The taxa relevant to Alberta were described by W. H. Edwards in 1863 and 1872, Klots in 1935, and Bowman in 1942.[7,13,14,15,34] In 1863, the taxon *alexandra*[14] was described from material collected in the region west of Denver, Colorado.[9] Later that year, *Colias christina* was described as a new species with type material from "the portage of the Slave River."[14] Kondla (in press) has clarified this type locality as being the vicinity of Mountain Rapids, Slave River, Alberta. Edwards introduced the name *astraea* as a new species based on a single male collected near Yellowstone Lake.[15] Klots added the name *krauthii* to the literature as a subspecies of *christina*.[34] The taxon *alberta* was described as a subspecies of *eurytheme*.[7] Ferris viewed it as a hybrid situation, while Miller and Brown treated it as a synonym for *eurytheme*.[21,45] I side with Hovanitz and Masters in treating it as a synonym for *C. christina*.[30,39,41]

Except for a listing as a subspecies of *C. occidentalis*, the name *alexandra* has survived the attention of various writers essentially unmolested.[44] The synonymy provided by Ferris shows that fate was not kind to the other taxa.[23] It did not take long for Stecker to align *christina* with *pelidne*. In 1878, Skinner moved *christina* back to species status, where it remained until the early 1960s. At this time, McHenry associated it with *C. occidentalis* and Dos Passos shifted *christina* to a subspecies of *alexandra*.[12] *Astraea* survived as a species in the literature until 1898 when Skinner placed it as a subspecies of *christina*. In 1949, Holland reverted to species status for *astraea*. Again, in the 1960s strange things happened. *Astraea* was variously placed as a subspecies of *occidentalis*, *scudderi* and *alexandra*. *Krauthii* has a somewhat cleaner history. It was not tinkered with for some 20 years, when it was moved to a subspecies of *occidentalis* and then *alexandra*.

The mass migration of *christina*, *astraea* and *krauthii* to their status as subspecies of *alexandra* appears to originate from the treatment of Ehrlich.[17] Dos Passos made these assignments explicit.[12] I have been unable to find any published arguments or data to support this arrangement.

This chapter of the story therefore leaves us in a situation where the conventional wisdom as reflected in the literature places taxa relevant to Alberta in the species *Colias alexandra*.

Characteristics of the Taxa Additional murkiness and confusion confront naturalists and lepidopterists when attempting to do something as apparently simple as using the literature to identify and attach some names to Alberta specimens. In random order, here is a smattering of what one finds when trying to attach descriptions to the names *alexandra*, *christina* and *astraea*:

alexandra

- Ferris - yellow (concolorous with the ground colour) dorsal spots on the dorsal surface of the secondaries in the males;[22]

- Pyle - some northern populations are orange; forewing yellow fringed; brighter yellow spot in hindwing cell; narrow black forewing and hindwing border; unrimmed cell spot on ventral hindwing; female yellow or white; refers to Alberta populations as “yellow populations”; wingspan 3.8-4.8 cm;[51]

- Royer - ventral hindwing with much reduced discal spot (always poorly outlined); narrow dorsal borders; females usually have no dorsal hindwing border at all; white females occur; 4-5.5 cm wingspan;[52]

- Brown - pale yellow upperside and cool, pale greyish green on ventral hindwing; albino females are rare; female black borders vague but rarely absent; straight outer margin of forewing; yellow wing fringes;[8]

- Ferris and Brown - male bright lemon yellow and female warmer yellow; ventral hindwing dusted with greenish grey scales; ventral hindwing discal spot unrimmed and usually quite small; white females occur in some colonies;[24]

- Howe - light bright yellow above, deepening to a warmer yellow outward to the dark border, especially of the hindwing; fringes yellow; no orange discal spot above; ventral hindwing grey-green to slaty grey with no rim on discal spot;[33]

- Scott - ventral hindwing is greyish with a silver spot lacking a rim; fringes yellow; wings yellow;[53]

- Tilden and Smith - referring generally to yellow subspecies: dorsal bright yellow in male, paler near wing bases; black border narrow, crossed by yellow veins; dorsal forewing cell spot usually small; dorsal hindwing discal spot inconspicuous but present; female yellow, occasionally white; ventral: hindwing greenish grey in both sexes; discal spot white with no ring; wing edge yellow, seldom pink.[56]

christina

- Howe - presumably all orange but cannot be sure;[33]
- Scott - orange on outer half of dorsal hindwing and outer 2/3 of dorsal forewing; ventral hindwing often has submarginal spots and rarely a central satellite spot;[53]
- Hooper - females more yellow and some of them albinistic, their hindwings almost or entirely lacking black margins; males orange above with a wide band of sulphur yellow across the base of each wing; silver spot in middle of hindwing beneath;[29]
- Ferris - somewhat variable in phenotype, considerable colour variation occurs in both sexes; some males completely orange and some females white form; dorsal wings of ‘classical’ male basally yellow and distally orange, colour transition abrupt; dorsal female wings generally yellow with an orange blush;[23]
- Masters - males extremely regular in appearance while females are extremely variable; 36 females from near the type locality were roughly 1/3 orange, 1/3 yellow, 1/3 white; female black bands absent to complete.[42]

astraea

- Ferris and Brown - males vary from warm yellow through orange and yellow to orange with a small amount of yellow basally; orange dorsal hindwing discal spot; females vary from pure white to overwashed with pink and orange;[24]
- Howe - variously mixed yellow to orange populations; yellow individuals, often predominant locally, have an orange discal spot on the dorsal hindwing;[33]
- McDunnough - white females; ventral hindwing discal spot not entirely constant, can be single or double;[43]
- Gerould - extreme variability in females; “most bewildering variety of colours,” “wonderfully variable species”;[27]
- Hovanitz - variation ranging from full yellow to bright orange in Waterton area;[32]
- Hovanitz - frequency of white females about 70%;[30]
- Scott - the description given under *christina* is applied to Alberta in total;[53]
- Tilden and Smith - usually a blend of orange and yellow; referring generally to orange subspecies; dorsal: “Male distinctively two-toned, orange with yellow at wing bases and costa. Female duller orange, usually heavily marked with dark borders and dark veins”; ventral: “dull orange to greenish grey in both sexes; often much dark overscaling. HW discal spot usually ringed.”[56]

Table 1. WHITE VS. YELLOW/ORANGE FEMALES FROM VARIOUS ALBERTA LOCALITIES

Location	yellow/ orange	white	total	% white
Ft. Smith-Fitzgerald	73	0	73	0
Pocahontas, 1948	8	21	29	72.4
Pocahontas, 1947	18	24	42	57.1
Mountains (unspecified)	3	13	16	81.3
Banff	66	39	105	37.1
Calgary	25	20	45	44.4
Calgary, 1948	1	1	2	
Macleod Junction		1	1	
Didsbury	14	12	26	46.2
Waterton Lakes	4	2	6	33.3
Laggan [Lake Louise]	23	13	36	36.1

For specific Alberta locations, here is what has been written:

- Masters - "A series of 36 males and 36 females of topotypical northern Alberta *Colias christina* (at Carnegie Museum) displayed slightly smaller size. Alberta males had a median forewing length of 24 mm, with the average slightly more than 24 mm; the range was between 22 and 27 mm. Alberta females had a median forewing length of 26 mm, with the average being slightly less that 26 mm; the range was between 19 and 29 mm; of the Alberta sample of nominate *christina*, only 27.8% of 36 females were orange, while 30.6% were yellow and 41.8% were white; ... the Alberta sample of 36 females contained 19.4% with immaculate wings, 44.4% with apex bands only, 22.2% with outer bands only and 13.4% with complete bands";[42]

- Hovanitz - provided data on the prevalence of white vs. yellow/orange females in samples from various Alberta localities (Table 1);[30]

- Ferris - map assigning most of eastern 2/3 of province to *christina* with a minor intrusion of *astraea* on the prairies and the rest of the province to intergrade forms: "Southern Alberta appears to represent a complex blend zone region. In the area from Calgary to Banff and east of the Rocky Mountains, specimens can be taken which represent *alexandra*, *astraea*, *christina* and *krauthii*. It is frequently possible to collect two or three good 'subspecies' at the same locality"; "Pure orange races of *alexandra* have been reported from the area near ... Pocahontas, Alberta. ... the Alberta specimens superficially resemble *krauthii* but are considerably smaller";[22]

- Ferris - "blend zone areas where all phenotypes can be collected in the same meadow (such as the Kananaskis Forest region south of Banff"; referring to *astraea*, "This phenotype occurs in southern Alberta (in the foothills west of Calgary and north to the Banff region)"; includes a map showing *alexandra* complex as being absent from much of northeastern Alberta (including the type locality of *christina*);[23]

- Hovanitz - in reference to waterways and areas to the north, "Toward the middle of July, *C.*

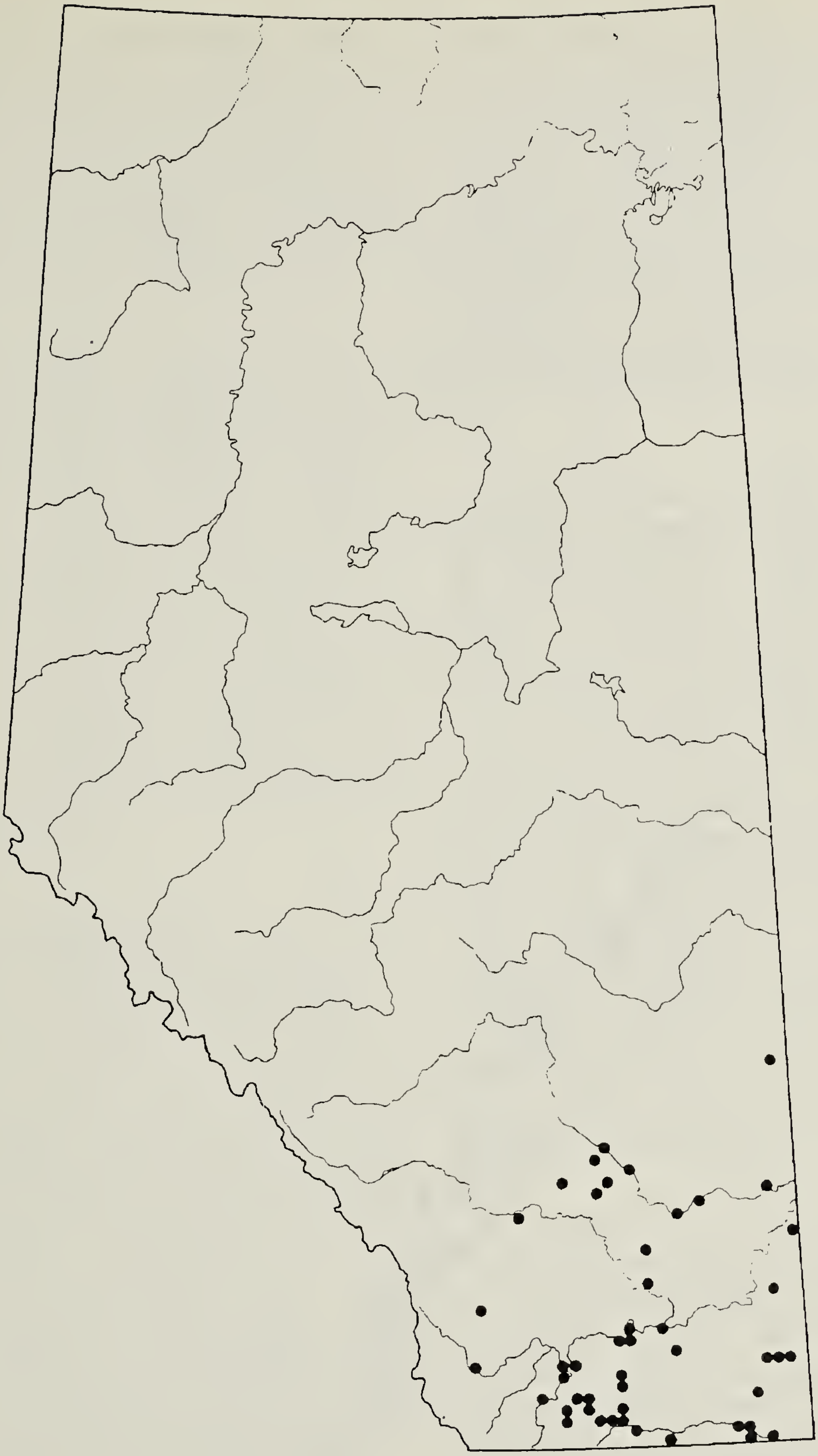


Figure 1. DISTRIBUTION OF *Colias alexandra* IN ALBERTA.

gigantea adults are replaced largely by those of *C. christina*"; in reference to Jasper and vicinity, "*Colias christina* occurs only below 5,000 feet in elevation and is most common in late July";[31]

- Hovanitz - "Populations ... from the north and east of [Waterton Lakes area] are generally orange or orange-yellow in the male";[32]
- Wolley Dod - "The females show most extraordinary variation. It is hard to find two alike";[58]
- Wolley Dod - referring to the area around Calgary, "scarcely any two (series of 30) even nearly alike in either colour or markings, much variation in male border."[59]

As well the following papers report

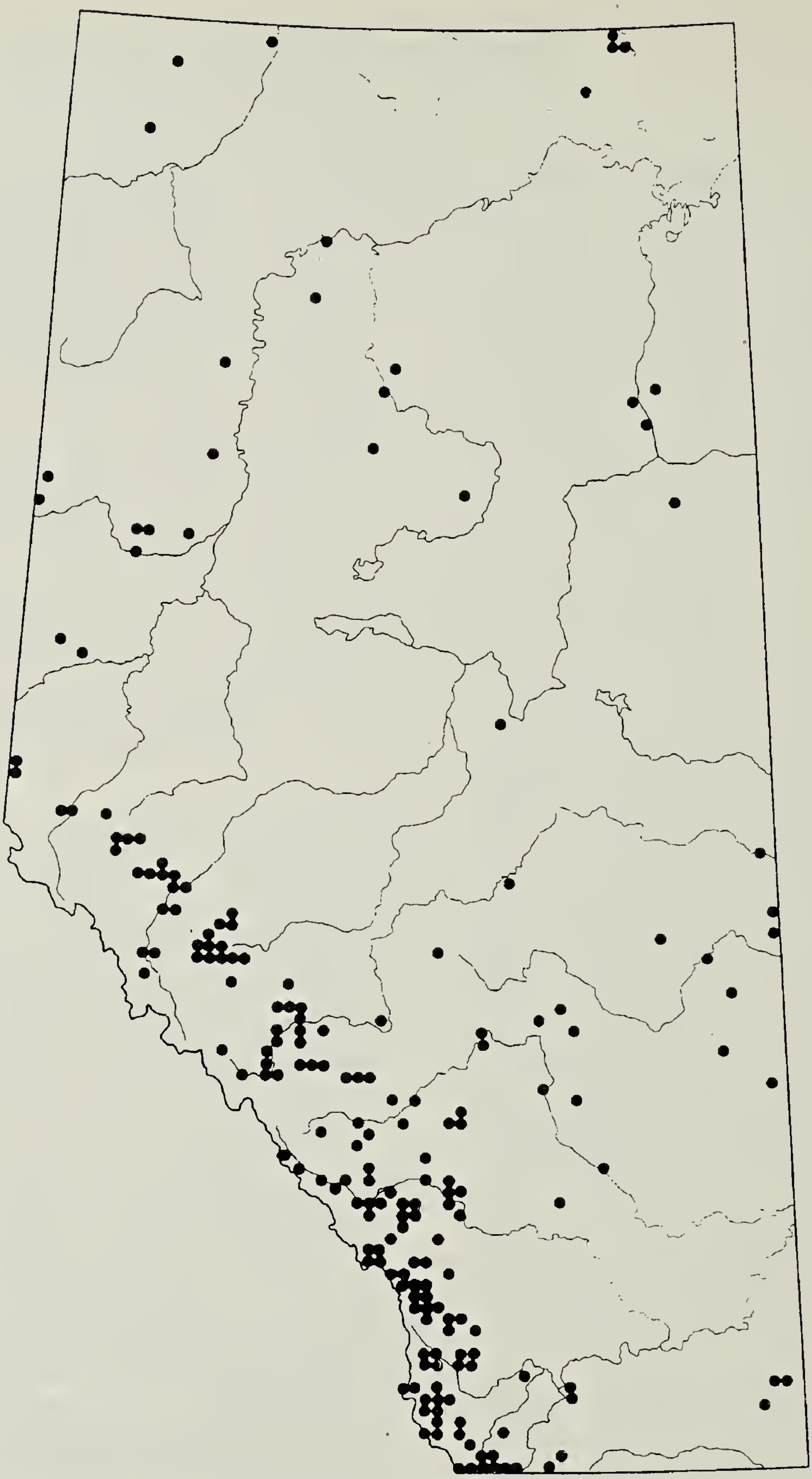


Figure 2. DISTRIBUTION OF *Colias christina* IN ALBERTA.

the occurrence of *christina* and *alexandra* at various Alberta locations: Anderson[1]; Bird[2]; Bird *et al.*[3]; Bowman[4,5,6,7]; Cary[10]; Case and Bird[11]; Eff[16,17,18,19,20]; Ferris[21,22,23]; Geddes[25,26]; Hovanitz[30]; Klots[34]; Kondla[35,36,37,38,39]; McDunnough[43]; Nicholl[46]; Pinel[47,48,49]; Pinel and Kondla[50]; Thormin, Kondla and Bird[55]; Whitehouse[57]; and Wolley Dod.[58,59,60]

Most reasonable people would look at such inconsistent and contradictory descriptive material (along with the supporting illustrations) and derive, for example, the following conclusions: males are yellow or orange or something in between; females are white or yellow or orange or some combination thereof; the black wing borders are narrow or wide; populations are variable in appearance or they are not; the hindwing underside may or may not have submarginal spots; the ventral hindwing dorsal spot may be orange or it may not; the ventral hindwing discal spot maybe silver or white and it may or may not have a satellite spot, etc.

Curious indeed. One could suppose that various authors are describing different species rather than a single species. Using the existing literature on what appearance (phenotype) is associated with various names, one would be successful if they attached the name *alexandra* to a yellow male, flipped a coin and called a yellow/orange or mostly orange male *astraea*, *christina* or *krauthii*, and threw a planning dart at a female and called it a *Colias* species unknown.

Fortunately all is not lost. Both species and subspecies names usually have a spatial (geographical) dimension and a phenotypic dimension. That is to say, by knowing where you caught, photographed or saw a critter, you can eliminate names that have a traditional geographic definition remote from the record under consideration. For example, a bug that looks like *krauthii* caught in southwestern Alberta obviously is not *krauthii* since this name is spatially defined as referring to bugs in the Black Hills of South Dakota. You can feel safe in knowing that a *Colias* from southwestern Alberta with at least some orange on it is probably *astraea* — unless of course it is *eurytheme* or *canadensis* or *meadii*.

Confused or misled? Of course! This statement is not a reflection on the work of many people who have researched the *alexandra* complex. It is an example of biological and taxonomic research at work. Field work; measurements; descriptions; publication of data; publication of opinions and speculation to foster more data collection; interpretation based on differing concepts and researcher backgrounds; conflicting interpretation based on differing data sets, analytical techniques, and spotty data sets, etc.; the list of reasons for disparate statements goes on and on.

A Local View of the Alberta Situation I became suspicious about the reported status of the *Colias alexandra* complex in 1978 when I caught a specimen of that species near Standard.[35] At that time *alexandra* was unreported in the literature for any specific Alberta location. The authoritative treatment of the day (Ferris) clearly indicated that I should have caught *christina* but that I could expect specimens that would be equally at home under the names *astraea*, *alexandra* or *krauthii*.[22] With a bit of additional field research around the province it soon became obvious that reality was in fact not as reported in the literature.

My personal work in Alberta over a 20 year period was supplemented by an exhaustive literature search that has yielded close to 400 references on Alberta butterflies and also by data collected by others. Particularly significant data have been provided by C.D. Bird, G. Hilchie, E.M. Pike, H. Pinel, S. Shigematsu and F.A.H. Sperling. The complete data base from which information was used represents contributions from nearly 300 individuals.

Regardless of which names will be shown to be correct by further research, there definitely appear to be two distinct species in the province. Figure 1 shows the distribution I have been able to document for *C.*

alexandra and Figure 2 shows the situation for *C. christina*.

By comparing these distribution maps with a map of ecoregions it is immediately clear that *alexandra* is essentially a prairie grassland insect and that *christina* is essentially a woodland insect. From a distribution and geographic perspective this reality suggests (and field work confirms) that there is in fact no broad band of intergradation, zone of intergradation or blend zone region as reported in the literature. This macro-scale forest and grassland distinction also holds up on a site basis. Most of the prairie occurrences of *christina* and *astraea* phenotypes are places where forest and grassland habitats are in juxtaposition.

The phenology (time of adult flight) of these two species is very interesting. The data set was examined from the perspective of stations and abundance. A station is defined as a report of butterfly occurrence at a single place on a single day. Abundance is synonymous with specimen count. Both station frequency and total abundance were plotted against phenology units for each month of the flight season. A phenology unit is defined as early, mid-, or late month as follows: early - days 1-10; mid - days 11-20; late - days 21-31. Since butterfly phenology is known to vary with latitude and altitude, the data set for *christina* was stratified according to the following scheme to account for regional differences: prairies, aspen parkland, boreal forest, southern mountains, and northern mountains. The Bow River valley was used as the northern terminus of the southern mountains region.

Colias alexandra extreme flight dates are 13 May and 1 September. The data show a very pronounced bimodal pattern consistent with a bivoltine (two brooded) butterfly. In fact, the break between broods is more substantial than illustrated by graphed data. No records of this species are available between 3 July and 23 July.

In contrast, the smaller *christina* data set shows a clear unimodal pattern consistent with a univoltine (single brooded) butterfly. Individuals of these taxa peak during the time window (mid-July) when *alexandra* is not known to fly. The small boreal forest *christina* data set also indicates a univoltine situation but with a peak flight in early July. The much more substantive aspen parkland sample again indicates a univoltine creature with a pronounced flight in mid-July.

The very substantial samples from the southern mountains and the northern mountains are congruent and show that *christina* is univoltine here as well. Peak flights are in mid-July. The abundance data also suggest that the butterfly is more abundant (where it occurs) in the northern mountains than it is in the southern mountains. This is in agreement with my own qualitative field observations. Extreme early and late flights for *christina* in the province are 10 May and 26 September.

Table 2 presents the readily observable differences between the taxa *alexandra* and *christina* (including *astraea*-like phenotypes) in Alberta. It does not include less observable differences requiring equipment for scrutiny nor differences in immature stages.

These differences are more dramatic than the differences between, for example, *C. pelidne* and *C. philodice*. Given the distributional,

Table 2. **COMPARISON OF *Colias christina* AND *Colias alexandra* IN ALBERTA.**

Colias christina	***Colias alexandra***
males variable but usually extensive orange areas on dorsal surface in at least 99% of individuals	males with no orange areas on dorsal surface, yellow except for black forewing discal spot and marginal band
male dorsal yellow areas of a lemon hue	males with dorsal cold yellow hue
male ventral hindwing mostly yellow in boreal region, mostly greenish elsewhere	male ventral hindwing greyish green
ventral hindwing discal spot larger and with red rim, frequent satellite spot in north	ventral hindwing discal spot smaller and does not have a red rim, no satellite spot
frequent ventral submarginal spots in boreal populations (especially in males)	no ventral submarginal spots
dorsal hindwing with large orange discal spot	dorsal hindwing without a discal spot, appearance of small pale spot is optical illusion due to ventral hindwing spot
wing fringes mostly pink	wing fringes yellow
males larger, FW length mostly 25-27 mm	male dorsal FW length mostly 22-23 mm
male dorsal FW black border wider, generally 3.5 mm	males smaller, FW black border generally narrower, 2 mm
females extremely variable in size, colour (yellow, orange, white or any combination thereof), amount of black dorsal marginal scaling	females consistent in size, 99% white, minimal black dorsal marginal scaling
antennae pink	antennae pale buff
dorsal forewing black band with yellow-orange overscaling; makes band look grey in fresh individuals	dorsal forewing black band without coloured overscaling
univoltine	bivoltine
found in boreal forest, mountains and some fescue prairie areas	found in prairie grasslands and some dry foothills grasslands

phenotypic, ecological, and phenological differences between these taxa, it is reasonable to conclude that they are in fact separate and distinct species. Both taxa were originally described as distinct species and various literature that treats them as one species does not provide solid support for such treatment. The highly variable *C. christina* populations of the southern mountains seem to have been misinterpreted by various researchers as evidence of intergradation between the taxa.

In Alberta *C. alexandra* is a remarkably consistent species. Specimens differ from the nominate subspecies in the following characteristics: smaller size, narrower forewing black borders, darker greyish green ventral hindwing, and almost all females white. These differences are more substantial than the differences between the nominate subspecies and subspecies *apache* which was described by Ferris.[23] Consequently these "prairie" populations which are known from the plains of Alberta, Saskatchewan, Montana, and North Dakota should be described as a new subspecies. Until such time as transitional populations to *C. alexandra alexandra* are documented, the possibility of separate species status for these prairie populations should not be categorically ruled out. Alberta populations of *C. alexandra* completely lack any dorsal hindwing discal spots which some literature deems to be a consistent characteristic of all *Colias* species. North American literature has traditionally claimed that this discal spot is concolorous with the ground colour but close examination shows that in fact there is no discal spot.

The variability, within and between populations, of *C. christina* makes general characterization over the whole province a real challenge. Some regional trends in Alberta are: boreal forest populations tend to be smaller, have a yellow ventral hindwing, frequently have ventral hindwing satellite spots and submarginal spots, and have a larger proportion of yellow and orange females; parkland populations are larger, have a pale greenish ventral hindwing; southern mountain populations are larger, have a greenish ventral hindwing and most females are white; the Mountain Park area in the northern mountains supports distinctive populations that are smaller, dark green on the ventral hindwing, frequently have substantial dark scaling on the basal portion of the dorsal hindwing, and most females are white. Many male specimens from the Mountain Park area resemble *C. christina kluanensis* (a Yukon subspecies) more than any other named subspecies.

The archtypal phenotype of nominate male *C. christina* is that of a dorsal surface with a sharply divided, deep, bright orange outer half and a bright yellow basal portion (e.g., Gillette[28]). Such individuals do occur in all sampled populations of *C. christina* in Alberta, except the Mountain Park populations where the bright yellow basal portion of the dorsal hindwing is mostly replaced with melanic scaling. These archtypal phenotypes are however a minority in sampled populations. Examination of a long series shows that variation runs from occasional individuals that are all yellow to those that are almost all orange. The most frequent male phenotype is a butterfly that is roughly one-half orange and one-half yellow on the dorsal surface with the orange of a paler hue and with an ill-defined transition from yellow to orange in comparison to the archtypal phenotype.

There remains then the problem of suitable names to attach to Alberta material. For the purpose of communicating the general appearance of individuals there is no problem. The existing names (*alexandra*, *astraea*, *krauthii*, and *christina*) can be used as convenient "handles" to communicate that the specimen at hand is consistent in phenotype with the characteristics normally associated with the name.

Attaching names in a true taxonomic sense is an unresolved problem at the time of writing. There are no published data to support lumping of the yellow prairie insect with nominate *C. alexandra*. Information presented herein suggests it is at least a distinct subspecies that should be formally described and given a name. The appropriateness of using the name *astraea* to refer to the southern mountain populations also needs to be critically reviewed. Again no published data exist to support lumping of Alberta material with populations from the vicinity of the type locality, at least not at the subspecies level. Ferris attributes *astraea* to Alberta but does not provide data to refute the equally unsubstantiated and contradictory opinion of Masters who states that southern Alberta and Alberta mountain populations are "statistically at least distinct from typical *astraea* from Wyoming."[21,23,41] At this time only the name *christina* can be confidently used as a species and subspecies name to reference the yellow/orange and mostly orange populations of the boreal forest.

1. ANDERSON, R.L. 1960. A collecting trip to the Nordegg area, July 4 and 5, 1960. Proceedings of the eighth annual meeting of the Entomological Society of Alberta. Pp. 14-16.

2. BIRD, C.D. 1975. Rhopalocera in the N.B. Sanson collection. *Journal of the Lepidopterists' Society* 30:201-206.

3. BIRD, C.D., G.J. HILCHIE, N.G. KONDLA, W.W. SMITH, E. KUYT, J.K. RYAN and T.W., THORMIN. 1982. Butterflies of northeastern Alberta. *Blue Jay* 40:141-53.

4. BOWMAN, K. 1919. Annotated checklist of the macrolepidoptera of Alberta. Alberta Natural History Society, Red Deer. 16 pp.

5. ——. 1921. Annotated check list of the macrolepidoptera of Alberta. Additions, 1919. *Can. Ent.* 53:13-14.

6. ——. 1923. Annotated check list of the macrolepidoptera of Alberta. Additions, 1921. *Can. Ent.* 55:71-72.

7. ——. 1942. A note of the *Colias eurytheme* Bdv., with description of a new race (Lepidoptera:Pieridae). *Can. Ent.* 74:25.

8. BROWN, F.M., D. EFF and B. ROTGER. 1957. Colorado butterflies. Denver Museum of Natural History, Denver, Colorado. 368 pp.

9. BROWN, F.M. 1973. The types of the pierid butterflies named by William Henry Edwards. *Transactions of the American Entomological Society* 99: 29-118.

10. CARY, M. 1906. On the diurnal lepidoptera of the Athabasca and MacKenzie regions, British America. *Proceedings of the United States National Museum* 31:425-57.

11. CASE, J.W. and C.D. BIRD. 1977. Butterflies and skippers of west-central Alberta. *Blue Jay* 35: 208-19.

12. DOS PASSOS, C.F. 1964. A synonymic list of the neararctic Rhopalocera. Lepidopterists' Society Memoir No. 1. 145 pp.

13. EDWARDS, W.H. 1863a. Descriptions of certain species of diurnal lepidoptera found within the limits of the United States and British America No. 1. *Proceedings of the Entomological Society of Philadelphia* 2:14-22.

14. ——. 1863b. Descriptions of certain species of diurnal lepidoptera found within the limits of the United States and British America No. 2. *Proceedings of the Entomological Society of Philadelphia* 2:78-82.

15. ——. 1872. Miscellaneous notes of butterflies, larvae, etc. *Can. Ent.* 24:105-11.

16. EFF, D. 1950. (coordinator). Rocky Mountains - New Mexico, Utah, to Alberta. Pp. 93-96 *in* The field season summary of North American lepidoptera for 1950. *Lepidopterists' News* 4:85-107.

17. ——. 1962. (coordinator). Season's summary. Zone III. Rocky Mountains area: Alberta, Wyoming, Utah, Colorado and New Mexico. *News of the Lepidopterists' Society* 3: 4-7.

18. ——. 1967. (coordinator). Season's summary. Zone III. Rocky Mountains area: Alberta, Wyoming, Utah, Colorado and New Mexico. *News of the Lepidopterists' Society* 3: 6-8.

19. ——. 1968. (coordinator). Season's summary. Zone III. Rocky Mountains area: Alberta, Wyoming, Utah, Colorado and New Mexico. *News of the Lepidopterists' Society* 3: 9-11.

20. ——. 1974. (coordinator). Season's summary. Zone III. Rocky Mountains area: Alberta, Wyoming, Utah, Colorado and New Mexico. *News of the Lepidopterists' Society* 2: 4-6.

21. FERRIS, C.D. 1972. Notes of certain species of *Colias* (Lepidoptera:Pieridae) found in Wyoming and associated regions. *Bull. of the Allyn Mus.* 5:1-23.

22. ——. 1973. A revision of the *Colias alexandra* complex (Pieridae) aided by ultraviolet reflectance photography

with designation of a new subspecies. *J. of the Lepidopterists's Society* 27:57-73.

23. ——. 1988. Revision of several Leguminosae-feeding *Colias* species, with description of a new subspecies (Pieridae:Coliadinae). *Bull. of the Allyn Mus.* 116:1-28.

24. FERRIS, C.D. and F.M. BROWN. 1981. (eds.). Butterflies of the Rocky Mountain States. Univ. of Oklahoma Press, Norman. 442 pp.

25. GEDDES, G. 1883. List of diurnal Lepidoptera collected in the Northwest Territory and the Rocky Mountains. *Can. Ent.* 15:221-23.

26. ——. 1889. Notes for collectors visiting the prairies and Rocky Mountains. *Can. Ent.* 21:57-58.

27. GEROULD, J.H. 1923. Inheritance of white wing color, a sex-limited (sex-controlled) variation in yellow pierid butterflies. *Genetics* 8:495-551.

28. GILLETTE, C.F. 1989. A revision of the “megalithic” *Colias alexandra* complex (Pieridae:Rhopalocera:Lepidoptera) with the discovery of a newly recognized species of *Colias* in Utah. *Utahensis* 7:31-60.

29. HOOPER, R.R. 1973. The butterflies of Saskatchewan. Saskatchewan Mus. of Natural History, Regina. 216 pp.

30. HOVANITZ, W. 1950. The biology of *Colias* butterflies. II. Parallel geographical variation of dimorphic color phases in North American Species. *Wasmann J. of Biology* 8:197-219.

31. ——. 1951. The biology of *Colias* butterflies. III. Variation of adult flight in the Arctic and Subarctic. *Wasmann J. of Biology* 9:1-9.

32. ——. 1965. *Colias christina - alexandra* intergradation. *J. of Research on the Lepidoptera* 4: cover illustration with caption.

33. HOWE, W.H. 1975. (ed.). The butterflies of North America. Doubleday, New York. 632 pp.

34. KLOTS, A.B. 1935. A new *Colias* from South Dakota (Lepidoptera:Pieridae). *American Museum Novitates* 767:1-2.

35. KONDLA, N.G. 1979. Skippers and butterflies of a prairie farm. *Alta. Nat.* 9:71-75.

36. ——. 1981. Skippers and butterflies of a disjunct aspen parkland area in Alberta. *Blue Jay* 39:4-12.

37. ——. 1983. Additional records of skippers and butterflies from Dinosaur Provincial Park. *Alta. Nat.* 13:152-57.

38. ——. 1986. Skippers and butterflies of the Kootenay Plains, Alberta. *Alta. Nat.* 16:11-14.

39. ——. 1991. A discussion of the correct status of *Colias eurytheme alberta. Utahensis* 6:44-45.

40. ——. In press. The type localities of *Colias christina* Edw. and *Oeneis caryi* Dyar. *Utahensis.*

41. MASTERS, J.H. 1970. Concerning *Colias eurytheme alberta* Bowman (Pieridae). *J. of Research on the Lepidoptera* 4:149-57.

42. ——. 1975. Variation in *Colias alexandra christina* Edwards (Pieridae) in southwest Manitoba. *J. of Research on the Lepidoptera* 9:97-99.

43. MCDUNNOUGH, J.H. 1922. Notes on the Lepidoptera of Alberta. *Can. Ent.* 54:134-41.

44. MCHENRY, P. 1962. The generic, specific and lower category names of the nearctic butterflies. *J. of Research on the Lepidoptera* 1:209-21.

45. MILLER, L.D. and F.M. BROWN. 1981. A catalogue/checklist of the butterflies of America North of Mexico. The Lepidopterists' Society Memoir No. 2. 280 pp.

46. NICHOLL, MRS. [DE LA B.] 1906. Butterfly collecting in Canada, 1904.

Annual Report of the Entomological Society of Ontario 1905. 36:70-80.

47. PINEL, H.W. 1983. Skippers and butterflies of the Indian Grove Campground area, Alberta. *Blue Jay* 41:71-77.

48. ——. 1985. Skippers and butterflies of the Crimson Lake Provincial Park, Alberta. *Blue Jay* 43:155-59.

49. ——. 1988. Skippers and butterflies of Bow Valley Provincial Park, Alberta. *Alta. Nat.* 18:7-10.

50. PINEL, H.W. and N.G. KONDLA. 1985. Skippers and butterflies of the Police Coulee area, Alberta. *Blue Jay* 43:213-23.

51. PYLE, R.M. 1981. The Audubon Society field guide to North American butterflies. Chanticleer Press, New York. 916 pp.

52. ROYER, R.A. 1988. Butterflies of North Dakota: an atlas and guide. Minot State Univ. Science Monograph No. 1. 916 pp.

53. SCOTT, J.A. 1986. The butterflies of North America: a natural history and field guide. Stanford Univ. Press, Stanford. 583 pp.

54. STRONG, W. and K. LEGGATT. 1981. Ecoregions of Alberta. Alberta Energy and Natural Resource. 64 pp.

55. THORMIN, T.W., N.G. KONDLA and C.D. BIRD. 1980. Further records of skippers and butterflies from the Milk River - Lost River area of southeastern Alberta. *Blue Jay* 38:5-10.

56. TILDEN, J.W. and A.C. SMITH. 1986. A field guide to the western butterflies. Houghton Mifflin, Boston. 370 pp.

57. WHITEHOUSE, F.C. 1918. A week's collecting on Coliseum Mountain, Nordegg, Alta. *Can. Ent.* 50:1-7.

58. WOLLEY DOD, F.H. 1901. Preliminary list of the macrolepidoptera of Alberta, N.W.T. *Can Ent.* 33:40-42, 155-72.

59. ——. 1908a. *Argynnis astarte* Doubl.-Hew., and other high mountain butterflies. *Entomological News* 40:108-14.

60. ——. 1908b. Further notes on Alberta Lepidoptera. *Can. Ent.* 40:181-93.

* * *

On butterfly migration: "On September 25, 1981, I observed approximately 6,000 Monarchs, 4,000 Red Admirals, 4,000 Question Marks, and 2,000 Mourning Cloaks moving south through a 10-foot wide path adjacent to the beach at Riis Park, Brooklyn, New York." *Jeffrey Glassberg, Butterflying Through Binoculars.*

* * *

Spiders are the major predators of butterflies. *R.M. Pyle. 1984. Audubon Society handbook for butterfly watchers. Scribner's, New York.*

BUTTERFLIES AND SKIPPERS OF PLATEAU MOUNTAIN, ALBERTA

HAROLD W. PINEL, 1017 - 19 Avenue Northwest, Calgary, Alberta, T2M 0Z8 and NORBERT G. KONDLA, Box 762, McBride, British Columbia. V0J 2E0

Plateau Mountain is located approximately 80 km southwest of Calgary in the Highwood-Livingston Range of the Rocky Mountains. The top of the mountain is a gently rolling plateau, and it is this feature that gives the mountain its name and makes it stand out from all other mountains in southern Alberta. The summit on the plateau has an elevation of 2,519 m. Timberline generally occurs between 2,135 and 2,300 m, with much local variation due to substrate, topography and wind exposure.[7]

It is due to the accessibility of Plateau Mountain over the years that its butterflies and skippers have been more intensively studied than those of any other mountain in Canada. The Forestry Trunk Road runs along the southern edge of the mountain. On the east side of the mountain there is a major gas well access road in the Upper Livingston River Valley. Side roads leading to well sites provide access to a series of cirques cut into the eastern slopes of the plateau. On the west side of the mountain there is a natural gas well access road that reaches the summit. This gravelled road runs north of the Forestry Trunk Road near the divide between Wilkinson and Dry Creek and winds uphill for about 9.5 km before reaching the top. This road is closed to public vehicle traffic, but it still provides for easy foot access.

It is believed that the entire plateau, rising 2,256 m at the north end to 2,519 m at the southern peak, was above the levels of Pleistocene glaciation. Ice may be assumed to have been present in all valleys around the mountain at least at the maximum of the first Cordilleran advance, when it is believed that the general ice level in the mountains of southwestern Alberta rose to about 2,100 m.[10]

There are no glaciers or permanent snowfields on Plateau Mountain, but permafrost exists. Permafrost extends possibly to a depth of 100 m or more before the plateau, the upper portion (to 30 m depth) being adjusted to the present climate and the lower levels apparently relic.[8]

Plateau Mountain lies in the rainshadow east of the Continental Divide. Little climatic data has been collected for the area, but Harris and Brown determined the mean annual air temperature to be -4.1°C on the summit, and 0.05°C in the subalpine forest at 2,266 m.[8] These authors give mean precipitation for the plateau from September 1974 to September 1976 as approximately 15 cm. Strong winds occur throughout the year on Plateau Mountain, and are of ecological significance in removing most of the snow from the plateau.

The vegetation of Plateau Mountain and immediately adjacent areas has been studied in detail.[7] The

Riding's Satyr *Gary W. Seib*

vegetational types vary from barrens and tundra communities to marsh/meadow and scrub communities to subalpine forest communities to disturbed areas to saxifrage moss community associated with vegetated cliffs where seepage occurs.

. The only previous paper on butterflies and skippers for Plateau Mountain was a flight calendar for those specimens known to occur in the alpine zone.[2] However, the mountain has been frequently visited by lepidopterists and much study material exists in personal and institutional collections, in addition to that used in the preparation of this paper.

Annotated List The following list is a result of field observations and collections made over a period of 29 years from 1962-1990 by the following people: Peter Allen (PA), R.L. Anderson (RA), A. Bird (AB), C.D. Bird (CB), B. and J. Carr (BJC), C.D. Ferris (CF), L.P. Grey (LG), M. Grinnel (MG), Cris Guppy (CG), G. Hilchie (GH), Norbert Kondla (NK), John Lake (JOL), David Lawrie (DL), J.A. Legge (JL), Ross Lein (RL), A.I.W. MacKenzie (AM), J.S. Nordin (JN), Ted Pike (TP), Harold Pinel (HP), J.D. Reist (JR), Jon Shepard (JS), Steve Shigematsu (SS), Felix Sperling (FS), Ernest Williams (EW), and R.E. Woodley (RW). All the field records occur between 16 June and 12 September. Dates indicating days for which specimen records are available are written in an abbreviated format by day, month, year followed by the collector's initials (e.g., 2/7/87 TP is 2 July 1987 Ted Pike). These are only given for the less common species. For the more common species, the flight period is noted by the first and last dates recorded with specimens.

The frequency and abundance of the different species is subjectively denoted by: common — occurs regularly in good numbers; fairly common — occurs regularly in average numbers; uncommon — occurs regularly

Pearl Crescent R.W. Knapton

in low numbers; occasional — occurs irregularly; and rare — recorded once or twice and not likely to be seen again.

The common names in the list, with one exception, are from Miller,[17] while scientific names generally follow Scott.[19] Deviations are based on more recent research.

Hesperiidae — Skippers

PERSIUS DUSKY WING (*Erynnis persius*) — Occasional in open grassy stretches along roadway in subalpine fir-Engelmann spruce forest at low elevations in early July; 10/7/71 TP, 12/7/86 JOL, 2/7/87 TP.

GRIZZLED SKIPPER (*Pyrgus centaureae loki*) — Uncommon in alpine flight records from 2 July to 6 August. Scott mentions that ssp. *loki* is biennial, flying mostly in odd years in Colorado, Wyoming and Labrador and at Churchill, Manitoba.[19] Interestingly, of the ten years for which there are flight records at Plateau Mountain, this species was recorded only three times in odd years.

ARCTIC SKIPPER (*Carterocephalus palaemon*) — Rare in open grassy area in subalpine forest; 18/7/83 NK, 8/7/90 DL. Kondla points out the salient features of the undescribed mountain subspecies.[13]

COMMON BRANDED SKIPPER (*Hesperia comma manitoba*) — Uncommon in alpine and subalpine meadows in even-numbered years with a recorded flight period of 8 July to 5 August. Field research and analysis of available data by Kondla shows that this taxon flies only in even-numbered years in the Rocky Mountains of Alberta and northern British Columbia. This phenomenon has not been previously reported in the literature.

DRACO SKIPPER (*Polites draco*) — Rare in moist subalpine meadow; 19/7/70 JS, 27/7/80 HP.

Milbert's Tortoise Shell *Juhachi Asai*

Papilionidae — Parnassians and Swallowtails

PHOEBUS' PARNASSIAN (*Parnassius phoebus smintheus*) — Common in alpine tundra and subalpine meadows. Flight records from 2 July to 12 September; being most abundant in late July and early August.

ANISE SWALLOWTAIL (*Papilio zelicaon*) — Rare in open grassy area in subalpine fir-Engelmann spruce woods; 1/8/83 JOL, 29/7/90 DL.

Pieridae — Whites and Sulphurs

WESTERN WHITE (*Pieris occidentalis*) — Common in alpine, subalpine meadows and disturbed open areas along roadway in subalpine fir-Engelmann spruce woods. It is most often seen flying about local prominences. Flight records from 2 July to 7 August.

MARGINED WHITE (*Pieris marginalis*) — Uncommon and localized, preferring shaded open areas along drainages in subalpine fir-Engelmann spruce woods. Flight period is from mid-July to early August; 10/7/71 TP, 5/8/72 GH, 16/7/77 HP, 26/7/80 NK, 1/8/83 JOL. Most North American literature has treated *Pieris napi* species group populations as being subspecies of the European *P. napi* on the basis of superficial morphological similarity. Evidence has been mounting for years that there are distinct species on this continent. Recently, enzyme electrophoretic methods have been used to further the argument that, in North America, there are species that are distinct from *P. napi*.[6] In Alberta, there are two species — *P. oleracea* which occurs in the boreal forest and *P. marginalis* which occurs in the mountains.

CABBAGE BUTTERFLY (*Pieris rapae*) — Occasional in disturbed area along roadways in July: 26/7/78 NK, 19/7/83 NK, 22/7/83 HP.

LARGE MARBLE (*Euchloe ausonides*) — Occasional in open grassy area along roadway in subalpine fir-Engelmann spruce woods from early July to early August; 5/8/72 GH, 2/7/87 TP, 8/7/88 HP.

NORTHERN MARBLE (*Euchloe creusa*) — Uncommon in subalpine meadows and alpine tundra with flight records from 24 June to 6 August.

SARA ORANGE TIP (*Anthocharis sara*) — Occasional in clearings in subalpine fir-Engelmann spruce woods in July; 16/7/77 HP, 22/7/83 HP. We use the species epithet "*sara*" only as a convenient handle to refer to the *Anthocharis sara* complex. Geiger and Shapiro present compelling evidence that present taxonomy in the gross morphospecies "*sara*" is unsatisfactory.[5]

CLOUDED SULPHUR (*Colias philodice eriphyle*) — Common in alpine and open areas in subalpine forest with a recorded flight period of 2 July to 11 August.

ALFALFA BUTTERFLY (*Colias eurytheme*) — Rare in alpine; 12/7/86 JOL.

CHRISTINA SULPHUR (*Colias christina astraea*) — Uncommon in subalpine meadows and clearings in subalpine forest. Flight period recorded from 2 July to 7 August. Recent studies show that the taxa *christina* and *astraea* are not conspecific with *C. alexandra* as treated in the literature for the past 30 years.[4,15]

MEAD'S SULPHUR (*Colias meadii elis*) — Common in alpine tundra and subalpine meadows. Flight records from 2 July to 12 September.

LABRADOR SULPHUR (*Colias nastes streckeri*) — Common in alpine tundra with flight records from 2 July to 22 August.

PELIDNE SULPHUR (*Colias pelidne skinneri*) — Occasional in alpine and clearings in subalpine woods: 31/7/69 JS, 5/8/72 GH, 7/8/77 SS.

Lycaenidae — Gossamer Wings

LITTLE COPPER (*Lycaena phlaeas arethusa*) — Common in alpine and subalpine meadows with flight periods from 2 July to 12 September, being most abundant in late July and early August.

LUSTROUS COPPER (*Lycaena cuprea snowi*) — Fairly common, but local, in alpine area. Flight records from 2 July to 7 August.

WESTERN TAILED BLUE (*Everes amyntula albrighti*) — Rare in open area in lower elevation subalpine forest: 3/7/71 TP.

SILVERY BLUE (*Glaucopsyche lygdamus couperi*) — Occasional in clearings in subalpine woods; 26/7/69 JS, 18/7/81 NK, 22/7/83 HP, 8/7/90 DL. Substantial species-level differences between the taxa *lydamus* and *couperi* have been documented.[3] The butterfly which occurs in Alberta may well become widely known as *Glaucopsyche couperi*.

NORTHERN BLUE (*Lycaeides idas*) — Fairly common in subalpine meadows and alpine tundra with flight records from 2 July to 7 August. The most appropriate subspecies name for southwestern Alberta material is not clear at the time of writing. The name *atrapraetextus* may be more appropriate than *scudderi* which has traditionally been attributed to the Alberta fauna.

MELISSA BLUE (*Lycaeides melissa*) — Rare in alpine areas and grassy cirques; 3/7/71 TP, 20/8/73 GH, 26/7/80 NK. This species is principally a grassland species in Alberta with small populations fingering their ways west into the foothills and mountains of southern Alberta.

GREENISH BLUE (*Plebejus saepiolus amica*) — Fairly common in moist alpine tundra, subalpine meadows and moist clearings in subalpine forest. Flight records from 2 July to 12 September.

ICARIOIDES BLUE (*Plebejus icarioides pembina*) — Occasional in alpine and subalpine as a stray from mid-July to early August; 5/8/72 GH and TP, 22/8/72 FS, 20/7/73 GH, 4/8/74 GH, 22/7/83 HP. The larval food plant, *Lupinus* spp., is not found in the study area, but occurs at lower elevations nearby.

RUSTIC BLUE (*Plebejus rusticus megalo*) — Common in alpine tundra and subalpine meadows with flight records from 2 July to 8 September.

Nymphalidae — Brushfoots

VARIEGATED FRITILLARY (*Euptoieta claudia*) — Occasional in alpine; 20/7/72 TP, 19/7/86 GH, 23/7/90 DL.

EDWARD'S FRITILLARY (*Speyeria edwardsii*) — rare in alpine; 4/8/74 PA.

ZERENE FRITILLARY (*Speyeria zerene garretti*) — Uncommon in subalpine meadows and alpine tundra. Flight records from 2 July to 5 August.

CALLIPPE FRITILLARY (*Speyeria callippe calgariana*) — Rare in alpine; 19/7/70 JS, 26/7/80 HP.

NORTHWESTERN FRITILLARY (*Speyeria electa*) — Occasional in alpine tundra, subalpine meadows, and clearings in subalpine woods with flight records from 2 July to 5 August. For the reasons given in Kondla, the authors side with Howe and Klassen *et al.* in recognizing this taxon as a separate species from *Speyeria atlantis*.[9,11,14]

MORMON FRITILLARY (*Speyeria mormonia*) — Fairly common in alpine tundra, subalpine meadows, and open areas in subalpine woods. Flight period from 2 July to 12 September.

BOG FRITILLARY (*Boloria eunomia*) — Common in moist subalpine and alpine areas dominated by willows. Flight period from 2 July to 23 August.

SILVER-BORDERED FRITILLARY (*Boloria selene*) — Rare: a stray was collected in the alpine on 22/7/83 NK.

FREIJA FRITILLARY (*Boloria freija*) — Rare in dry open areas in subalpine fir-Engelmann spruce woods: 24/6/77 NK.

ALBERTA FRITILLARY (*Boloria alberta*) — Uncommon and local in odd-numbered years in alpine tundra with flight records from 2 July to 19 September. In Alberta, this species is known from only two locations south of Banff National Park. Real abundance of this species is unknown due to its biennial flight habits and propensity to fly over steep fellfields which are hazardous to naturalists.

ASTARTE FRITILLARY (*Boloria astarte*) — Fairly common but local in alpine tundra, generally found flying rocky ridges close to its food plant, *Saxifraga bronchialis*. Flight records from 2 July to 11 August.

TITANIA FRITILLARY (*Boloria titania grandis*) — Fairly common in clearings in subalpine woods and in subalpine meadows, with a recorded flight period of 2 July to 18 August.

NORTHERN CHECKERSPOT (*Chlosyne palla*) — Rare in moist subalpine meadows; 5/8/72 GH.

DAMOETUS CHECKERSPOT (*Chlosyne damoetus*) — Occasional in the alpine with flight records from 20 July to 8 August.

PEARL CRESCENT (*Phyciodes morpheus*) — Rare in clearings in subalpine woods at lower elevations; 19/7/83 NK, 22/7/83 HP.

FIELD CRESCENT (*Phyciodes pratensis*) — Uncommon in subalpine meadows, clearings in subalpine woods, and alpine tundra from 2 July to 5 August.

ANICIA CHECKERSPOT (*Euphydryas anicia*) — Common in alpine tundra, subalpine meadows, and clearings and roadways in subalpine woods. Flight period from 2 July to 6 August.

EDITH'S CHECKERSPOT (*Euphydryas editha*) — Common, but fairly local, in alpine tundra with a recorded flight period of 2 July to 11 August.

SATYR ANGLEWING (*Polygonia satyrus*) — Rare along streams in subalpine woods; 7/8/77 SS, 27/7/80 TP, 31/7/83 NK.

ZEPHYR (*Polygonia zephyrus*) — Rare in alpine; 6/8/89 HP. This is a woodland species, but summer adults often fly to the higher elevations of mountains, even to the alpine zone to feed on flowers.[19]

CALIFORNIA TORTOISE SHELL (*Nymphalis californica*) — Rare migrant in alpine tundra where it was recorded in July of 1987; three individuals on 2/7/87 TP; two on 12/7/87 NK; and singles on 14/7/87 MG and 15/7/87 MG.

MILBERT'S TORTOISE SHELL (*Nymphalis milberti furcillata*) — Common in alpine tundra, subalpine meadows, and clearings and roadways in subalpine woods. Flight records from 12 July to 11 August.

PAINTED LADY (*Vanessa cardui*) — Occasional migrant species observed in all habitats; 5/8/72 GH, 29/7/73 SS, 19/7/83 NK, 22/7/83 HP.

WHITE ADMIRAL (*Limenitis arthemis rubrofasciata*) — Rare in moist subalpine meadows and moist clearings in subalpine woods; 21/7/75 SS, 25/7/83 EW, 1/8/83 JOL.

Satyridae — Satyrs, Browns, and Wood Nymphs

RINGLET (*Coenonympha tullia benjamini*) — Occasional in alpine tundra, subalpine meadows, and along roadway clearings in subalpine forest during July and the first half of August; 11/8/63 AM, 21/7/74 GH, 27/7/80 TP, 31/7/83 NK, 9/7/88 HP, 6/8/89 HP.

COMMON ALPINE (*Erebia epipsodea epipsodea*) — Common in alpine tundra, subalpine meadows, and in roadway clearings in subalpine woods. Flight records from 2 July to 7 August.

RIDINGS' SATYR (*Neominois ridingsii minimus*) — Rare straggler collected in alpine tundra 18/7/79 CG. This record is the only known high elevation mountain record for the province. The normal range of this

Table 1. COMPARISON OF PLATEAU MOUNTAIN RHOPALOCERAN FAUNA TO THE FAUNA OF PETER LOUGHEED PROVINCIAL PARK AND THE TOTAL PROVINCIAL FAUNA

	Plateau Mountain		Alberta		Peter Lougheed Provincial Park[16]	
Family	No. of species	% of fauna	No. of species	% of fauna	No. of species	% of fauna
Hesperiidae	5	8.5	27	16.7	5	8.5
Papilionidae	2	3.4	7	4.3	2	3.4
Pieridae	12	20.3	23	14.2	13	22.0
Lycaenidae	9	15.2	35	21.6	9	15.2
Nymphalidae	24	40.7	51	31.5	23	39.0
Danaidae	0	0	1	0.6	0	0
Satyridae	7	11.9	18	11.1	7	11.9
	59	100	162	100	59	100

species is the mixed grasslands of southeastern Alberta. Subspecies minimus was described by Austin.[1]

CHRYXUS ARCTIC (*Oeneis chryxus chryxus*) — Common in alpine tundra, subalpine meadows, and clearings in subalpine woods with flight records from 2 July to 7 August.

UHLER'S ARCTIC (*Oeneis uhleri varuna*) — Occasional in alpine tundra; 16/6/74 GH, 17/7/79 CG, 26/7/84 JS, 6/8/89 HP.

JUTTA ARCTIC (*Oeneis jutta chermocki*) — Rare in moist boggy area in subalpine forest; 4 & 5/8/78 NK, 11/7/87 NK.

MELISSA ARCTIC (*Oeneis melissa beani*) — Fairly common in alpine tundra with flight records from 9 July to 6 August.

Discussion The known butterfly and skipper fauna of Plateau Mountain consist of 59 species, representing 6 of the 7 families of Rhopalocerans found in Alberta as follows: Hesperiidae — 5, Papilionidae — 2, Pieridae — 12, Lycaenidae — 9, Nymphalidae — 24, and Satyridae — 7. Table 1 compares the Rhopaloceran fauna of the study area to that of Alberta. As shown in Table 1, the Plateau Mountain fauna has a significantly greater portion of its fauna represented by the Pieridae and Nymphalidae, and a significantly lesser portion presented by the Hesperiidae and Lycaenidae, than the total Alberta fauna.

It is noteworthy that the same number of butterfly and skipper species have been recorded at Plateau Mountain as in the entire Peter Lougheed (Kananaskis) Provincial Park, a park of 50,308 ha whose southern boundary is approximately 50 km north of Plateau Mountain.[16] As well, an almost identical number of species per family has been recorded in both areas as illustrated in Table 1. In comparing the actual species, 76% (45 of 59) are common to both Plateau Mountain and Peter Lougheed Provincial Park.

Of the 59 species recorded for Plateau Mountain, 55 (93.2%) have been reported in July and 44 (74.6%) have been reported in August. Table 2 summarizes the known temporal distribution for each butterfly and skipper species recorded for Plateau Mountain. Figures 1 and 2 graph the

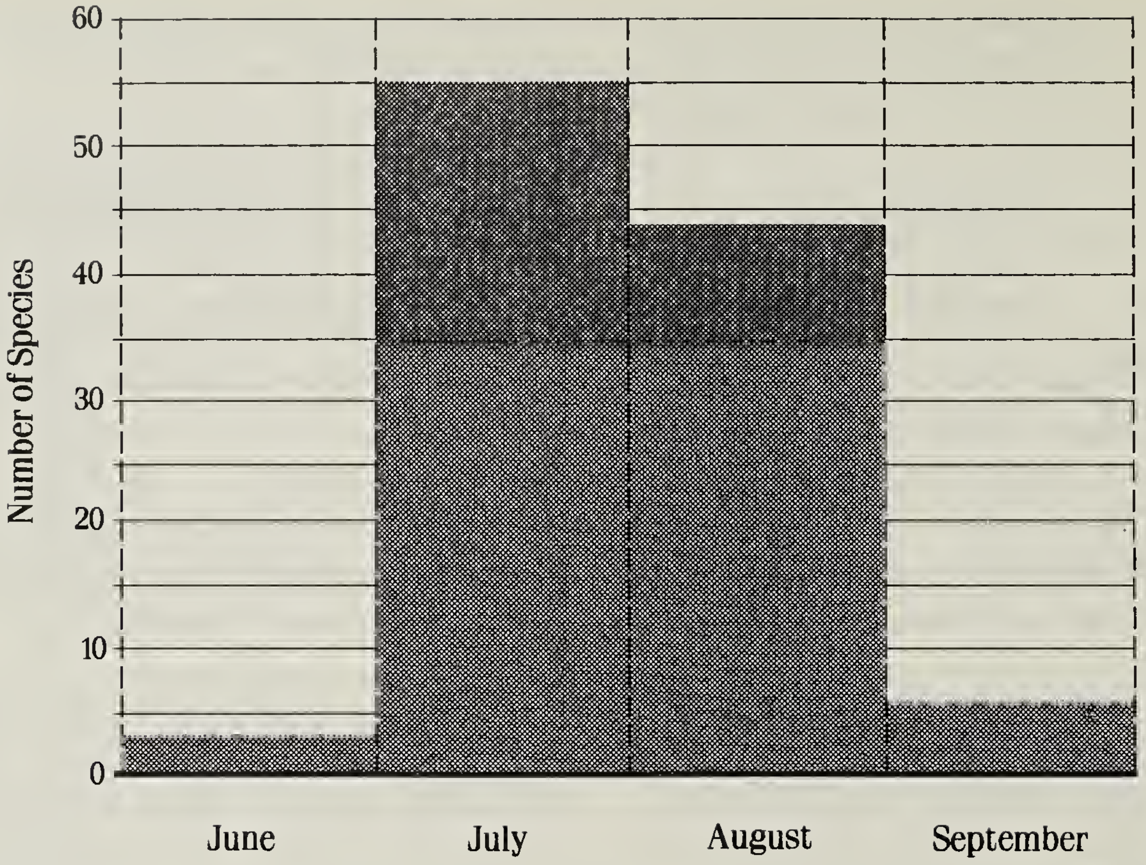


Figure 1. NUMBER OF BUTTERFLY AND SKIPPER SPECIES RECORDED ON A MONTHLY BASIS.

species diversity on a monthly and weekly basis. The greatest diversity of species occurs during the last half of July and the first week of August. The temporal data also illustrate that a large diversity of species is recorded over a short time span. This is further amplified when one realizes that all the field data throughout the years 1962 and 1990 fall within the time period of 16 June to 12 September, a period of just under 90 days.

A unique assemblage of butterfly species has been recorded for Plateau Mountain. There are migrants and strays represented by species such as *Colias eurytheme*, *Euptoieta claudia*, *Nymphalis californica*, *Vanessa cardui*, and *Neominois ridingsii minimus.* The first four species are expected, but the record of Riding's Satyr is extremely unusual. The Riding's Satyr is a characteristic butterfly of dry mixed grasslands in southeastern Alberta, with few records west of a line drawn from Fort MacLeod in the south to Drumheller in the north. The report from Plateau Mountain is the only mountain record for the province, and represents one of the late dates for this species' known flight period (11 June — 23 July) in Alberta.

A number of other species recorded on Plateau Mountain occur there irregularly, and in the annotated list they are described as rare or occasional. These are species for which little or no suitable habitat and/or food plants exist in the study area, but suitable habitat exists nearby, mainly to the east in the foothills where mixed woods, aspen woods, and pockets of grasslands, and wetland complexes exist.[18] Species in this category include *Erynnis persius*, *Carterocephalus palaemon*, *Papilio zelicaon*, *Everes amyntula albrighti*, *Speyeria edwardsii*, *Boloria selene*, *Boloria freija*, *Chlosyne palla*, *Phyciodes morpheus*, and *Polygonia zephyrus.* Pinel recorded all these species except *C. palaemon* and *P. zephyrus* in a small study area around Indian Grave Campground, an area approximately only 9 km east of Plateau Mountain, and suitable

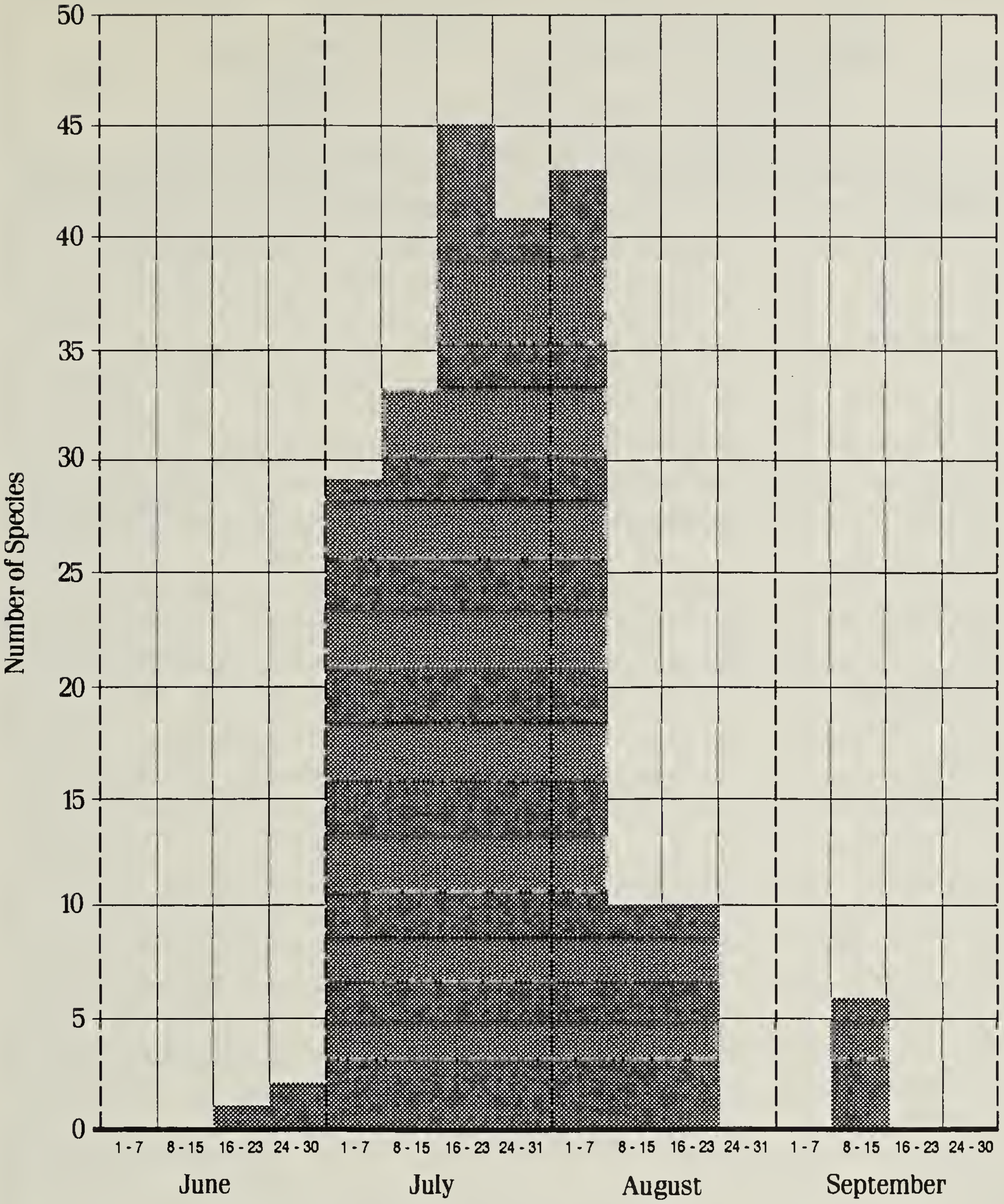


Figure 2. NUMBER OF BUTTERFLY AND SKIPPER SPECIES RECORDED ON A WEEKLY BASIS.

habitat exists even closer to Plateau Mountain for all these species.[18]

Why have so many lower elevation species of various habitats turned up in the alpine and upper subalpine zones of Plateau Mountain? One reason is hilltopping as a result of mate-locating behaviour.[12] Another factor that comes into play in mountainous areas is the well known phenomenon of upslope winds due to daytime warming of the land. These upslope mountain winds assist species that are moving up slopes for purposes of mate location, but also transport other species which do not engage in mate-locating hilltopping behaviour to mountain tops.

In examining the data, two species were noted to have biennial flight periods on Plateau Mountain. *Boloria alberta* occurs only in odd-numbered years, while *Hesperia comma manitoba* flies only in even-numbered years. Another interesting observation was the large number of

Table 2. TEMPORAL DISTRIBUTION OF BUTTERFLIES AND SKIPPERS RECORDED AT PLATEAU MOUNTAIN

	June		July				August				Sept.	
	16-23	24-30	1-7	8-15	16-23	24-31	1-7	8-15	16-23	24-31	1-7	8-15
HESPERIIDAE												
Erynnis persius			x	x								
Pyrgus centaureae loki			x	x	x	x	x					
Carterocephalus palaemon				x	x							
Hesperia comma manitoba				x	x	x	x					
Polites draco					x	x						
PAPILIONIDAE												
Parnassius phoebus smintheus			x	x	x	x	x	x	x			x
Papilio zelicaon						x	x					
PIERIDAE												
Pieris occidentalis			x	x	x	x	x					
Pieris marginalis				x	x	x	x					
Pieris rapae					x	x						
Euchloe ausonides			x	x			x					
Euchloe creusa		x		x	x	x	x					
Anthocharis sara					x							
Colias philodice eriphyle			x	x	x	x	x	x				
Colias eurytheme				x								
Colias christina astraea			x		x		x					
Colias meadii elis			x	x	x	x	x		x			x
Colias nastes streckeri			x	x	x	x	x	x	x			
Colias pelidne skinneri						x	x					
LYCAENIDAE												
Lycaena phlaeas arethusa			x	x	x	x	x	x	x			x
Lycaena cuprea snowi			x	x	x	x	x					
Everes amyntula albrighti			x									
Glaucopsyche lygdamus couperi				x	x	x						
Lycaeides idas			x		x	x	x					
Lycaeides melissa			x			x			x			
Plebejus saepiolus amica			x	x	x	x	x					x
Plebejus icarioides pembina					x		x		x			
Plebejus rusticus megalo			x	x	x	x	x	x	x			x

Table 2. Continued

	June		July				August				Sept.	
	16-23	24-30	1-7	8-15	16-23	24-31	1-7	8-15	16-23	24-31	1-7	8-15
NYMPHALIDAE												
Euptoieta claudia					x							
Speyeria edwardsii							x					
Speyeria zerene garretti			x		x	x	x					
Speyeria callippe calgariana					x	x						
Speyeria electa			x		x	x	x					
Speyeria mormonia			x	x	x	x	x	x	x			x
Boloria eunomia			x	x	x	x	x		x			
Boloria selene					x							
Boloria freija		x										
Boloria alberta			x	x	x	x	x					
Boloria astarte			x	x	x	x	x	x				
Boloria titania grandis			x	x	x	x	x		x			
Chlosyne palla							x					
Chlosyne damoetus					x	x	x					
Phyciodes morpheus					x							
Phyciodes pratensis			x	x	x	x	x					
Euphydryas anicia			x	x	x	x	x					
Euphydryas editha			x	x	x	x	x	x				
Polygonia satyrus						x	x					
Polygonia zephyrus							x					
Nymphalis californica			x	x								
Nymphalis milberti furcillata				x	x	x	x	x				
Vanessa cardui					x	x	x					
Limenitis arthemis rubrofasciata					x	x	x					
SATYRIDAE												
Coenonympha tullia benjamini			x	x	x	x	x	x				
Erebia epipsodea			x	x	x	x	x					
Neominois ridingsii minimus					x							
Oeneis chryxus chryxus			x	x	x	x	x					
Oeneis uhleri varuna	x				x	x	x					
Oeneis jutta chermocki				x			x					
Oeneis melissa beani				x	x	x	x					

Milbert's Tortoise Shell (*Nymphalis milberti furcillata*) seen flying and nectaring in the alpine zone during the summer. This species is commonly associated with disturbed areas and clearings at lower elevations where its food plant Common Nettle (*Urtica gracilis*) grows.

Some of the species recorded for the alpine area of Plateau Mountain such as *Lycaena cuprea snowi*, *Chlosyne damoetus*, *Euphydryas editha*, *Boloria alberta*, *Boloria astarte*, and *Oeneis melissa beani* are largely restricted to alpine areas in Alberta.

In 1991, the Government of Alberta and Husky Oil joined forces to establish Plateau Mountain as an ecological reserve. The protection now afforded this unique area will help preserve its butterfly fauna. As well, a number of other representative and special natural features will be protected for future generations to enjoy.

Acknowledgements The authors thank the people listed in the preamble to the annotated list for sharing their information about the butterflies of Plateau Mountain. The paper would not have been possible without their contributions. Information provided by Gerry Hilchie and Ted Pike has been especially helpful in rounding out our knowledge of the Plateau Mountain fauna.

1. AUSTIN, G.T. 1986. A review of the Satyrine genus *Neominois*, with descriptions of three new subspecies. *Bul. of the Allyn Mus.* 107:1-27.
2. BIRD, C.D. 1975. A calendar of the butterflies and skippers of the alpine area of Plateau Mountain. *Alta. Nat.* 5(1):26-28.
3. DIRIG, R. and J.F. CRYAN. 1991. The status of Silvery Blue subspecies (*Glaucopsyche lygdamus* and *G. l. couperi*: Lycaenidae) in New York. *J. of the Lepidopterists' Society* 45:272-90.
4. FERRIS, C.D. 1993. Reassessment of the *Colias alexandra* group, the legume-feeding species, and preliminary cladistic analysis of the North American *Colias* (Pieridae: Coliadinae). *Bull. of the Allyn Mus.* No. 138. 91 pp.
5. GEIGER, H. and A.M. SHAPIRO. 1986. Electrophoretic evidence for speciation within the nominal species *Anthocharis sara* Lucas (Pieridae). *J. of Research on the Lepidoptera* 25:15-24.
6. —— 1992. Genetics, systematics and evolution of holarctic *Pieris napi* species group populations (Lepidoptera, Pieridae). *Z. zool. Syst. Evolut. -forsch.* 30:100-22.
7. GRIFFITHS, G.C.D. 1982. Vegetation survey and mapping of the Plateau Mountain candidate ecological reserve. Alberta Energy and Natural Resources. Public Lands Division.
8. HARRIS, S.A. and R.J.E. BROWN. 1978. Plateau Mountain: a case study of alpine permafrost in the Canadian Rocky Mountains. Pp. 385-391 *in*: Proc. third International Conference on Permafrost (1978), vol. 1. National Research Council of Canada, Ottawa.
9. HOWE, W.H. 1975. (ed.). The butterflies of North America. Doubleday, New York. 632 pp.
10. KARPUK, E.W. and A.G. LEVINSOHN. 1980. Physical land classification of the Livingstone-Porcupine study area. E.N.R. Report No. 127. Alberta Energy and Natural Resources, Edmonton.
11. KLASSEN, P., A.R. WESTWOOD, W.B. PRESTON, and W.B. MCKILLOP. 1989. The butterflies of Manitoba. Manitoba Museum of Man and Nature, Winnipeg. 289 pp.
12. KONDLA, N.G. 1981. Skippers and

butterflies of a disjunct aspen parkland area in Alberta. *Blue Jay* 39:4-12.

13. —— 1986. Skippers and butterflies of the Kootenay Plains, Alberta. *Alta. Nat.* 16:11-14.

14. —— 1992. An update on the butterflies of the Redwater sand dunes. *Alta. Nat.* 22:10-17.

15. —— 1993. The *Colias alexandra* complex in Alberta. *Alta. Nat.* 23(3):57-61.

16. KONDLA, N.G. and C.D. BIRD. 1979. Skippers and butterflies of Kananaskis Park, Alberta. *Blue Jay* 37:73-85.

17. MILLER, J.Y. 1992. The common names of North American butterflies. Smithsonian Institution Press, Washington. 177 pp.

18. PINEL, H.W. 1983. Skippers and butterflies of the Indian Grove Campground area, Alberta. *Blue Jay* 41:71-77.

19. SCOTT, J.A. 1986. The butterflies of North America: a natural history and field guide. Stanford Univ. Press, Stanford. 583 pp.

* * *

Because their caterpillars eat milkweed, Monarch butterflies are considered to be distasteful, even poisonous, to birds. However, at wintering sites in Mexico, Monarchs are the main food of Black-headed Grosbeaks. Some milkweeds are less poisonous than others and the butterflies become less toxic with time. *Scott. 1986. Butterflies of North America. Stanford Univ., Stanford.*

* * *

On butterfly nomenclature: "The situation regarding the English names of American butterflies has been rather a mess. ...Unfortunately, scientific names can also cause confusion." *Jeffrey Glassberg, Butterflying through binoculars.*

HOUSE FINCH AT ABERNETHY IN 1990

RONALD A. BITTNER, Box 97, Abernethy, Saskatchewan. S0A 0A0

The date was 3 June 1990 and the time was mid-afternoon. As I walked around the end of the house I heard an unexpected bird song. I looked up and saw a red, sparrow-sized bird on a wire between the house and a utility pole. After about five seconds the bird flew across the street into some trees and disappeared from view. Based on this brief observation from a distance of 30 ft., I assumed that the bird was a Purple Finch.

I was surprised to see a Purple Finch in June. Almost all my sightings have been during spring migration. A recent review of my notes from 1983 to 1993 shows that Purple Finches were sighted on 28 separate days ranging from 12 April to 7 May. There were only three sightings outside this range: 13 May 1990, 10 July 1983 and 2 October 1983.

I went back into the house assuming that I would not see this bird again. A few minutes later I looked out the window and saw a red bird — almost certainly the same one — on our hanging feeder in the back yard. This time I was able to get a much better look at it. I observed with binoculars from a distance of 20 ft., first from in the house and then outside. The bird did not seem to be unduly alarmed when I went outside.

Compared to a male Purple Finch this bird seemed slightly smaller and slimmer. While the Purple Finch is more or less all red, this bird might be better described as a brown bird with red patches. The red was confined to forehead, eye line, rump, throat and upper breast. The lower breast and flanks were whitish and streaked with brown, quite different than the relatively unmarked underparts of the male Purple Finch. The shade of red needed no qualifying, it was simply bright red. The Purple Finch is often described as rose or wine coloured.

After studying the bird for five minutes I went back into the house and took a quick look at my bird guides.[1,2,3,4] It was quite obvious that this bird was a House Finch. I got the camera, hoping that the bird would come to our window shelf feeder. It did, and I took the first photo from a distance of 5 ft. The bird has a sunflower seed in its beak. It left the shelf for a moment, and I moved closer to the window hoping to get a better picture. The bird returned, and the second photo was taken from 3 ft. away. The pictures were taken with a 50-mm lens and Kodachrome 64 film. The bird spent a total of about 15 minutes in our yard and was not seen again.

As a footnote to this story, I saw what I think was a female House Finch at our hanging feeder on 6 April 1993. Compared to a female

Purple Finch this bird seemed smaller, and the streaking was less distinct. The face lacked the strong pattern of the female Purple Finch. The bill was stout, unlike the thinner bill of the Pine Siskin. This bird stayed for a few minutes and was not seen again.

1. GODFREY, W.E. 1986. The birds of Canada. National Museum of Canada, Ottawa. 595 pp.
2. PETERSON, R.T. 1961. A field guide to western birds. Houghton Mifflin, Boston. 366 pp.
3. ROBBINS, C.S., B. BRUUN and H.S. ZIM. 1966. Birds of North America. Golden Press, New York. 340 pp.
4. SCOTT, S.L., ed. 1987. Field guide to the birds of North America. National Geographic Society, Washington, D.C. 464 pp.

◆

Young, Long-eared Owl *Mabel Charlton*

AVIAN BOTULISM WITHIN EYEBROW MARSH, SASKATCHEWAN: 1988-1992

LYLE W. SAIGEON, Ducks Unlimited Canada, Box 4465, Regina, Saskatchewan. S4P 3W7

Eyebrow Marsh has a history of substantial waterfowl die-offs that have been attributed to avian botulism (*Clostridum botulinum*). Information gathered through the 1980s and early 1990s provides insight into the magnitude of waterfowl mortality and possible patterns associated with the incidence of the disease. Observations to date suggest that intensive water level management may not be a reliable means of reducing the regularity of occurrence or overall mortality. Projecting the timing of the first incidence of vertebrate carcasses, and expeditious removal of carcasses may be the most effective management tools.[2]

Here I describe and provide casual observations from Eyebrow Marsh over five consecutive years. Trends that relate current management practices to botulism occurrences and the usefulness of disease prevention and control efforts are discussed.

Eyebrow Marsh is situated within the mixed grass prairie of south-central Saskatchewan (Figure 1) approximately 75 km northwest of Moose Jaw. Historically, the marsh existed as a 1,000-acre channel wetland along the floodplain of the Qu'Appelle River. Through the construction of impoundments and water control structures the flooded area was expanded to 2,200 acres of permanent marsh contained within five wetland management units. Eyebrow Marsh has a history of recurrent avian botulism.

Waterfowl botulism is a paralytic, often fatal, disease resulting from ingestion of toxin produced by the botulism bacteria, usually Type C toxin. Not enough is known about the factors that lead to an outbreak. Locke and Friend identify the important environmental factors that contribute to the initiation of avian botulism outbreaks as water depth, water level fluctuations, and water quality; the presence of vertebrate and invertebrate carcasses; rotting vegetation; and high ambient temperature.[3] Wobeser et al. reported that despite the occurrence of suitable environmental factors and suitable bacterial substrate in most marshes the disease does not occur ubiquitously.[5] While the bacterium is present within many prairie wetlands those marshes that have regular, severe outbreaks might have a much higher prevalence of spores within the upper sediments. Disease control measures to consider from a management perspective are: water level maintenance; projecting timing of the initial outbreak; and vertebrate carcass removal and disposal.[2]

Significant losses of waterfowl occurred during the period of 1988 to 1992 (Table 1). Despite inconsistencies in record keeping, it appears that dry conditions during the early to

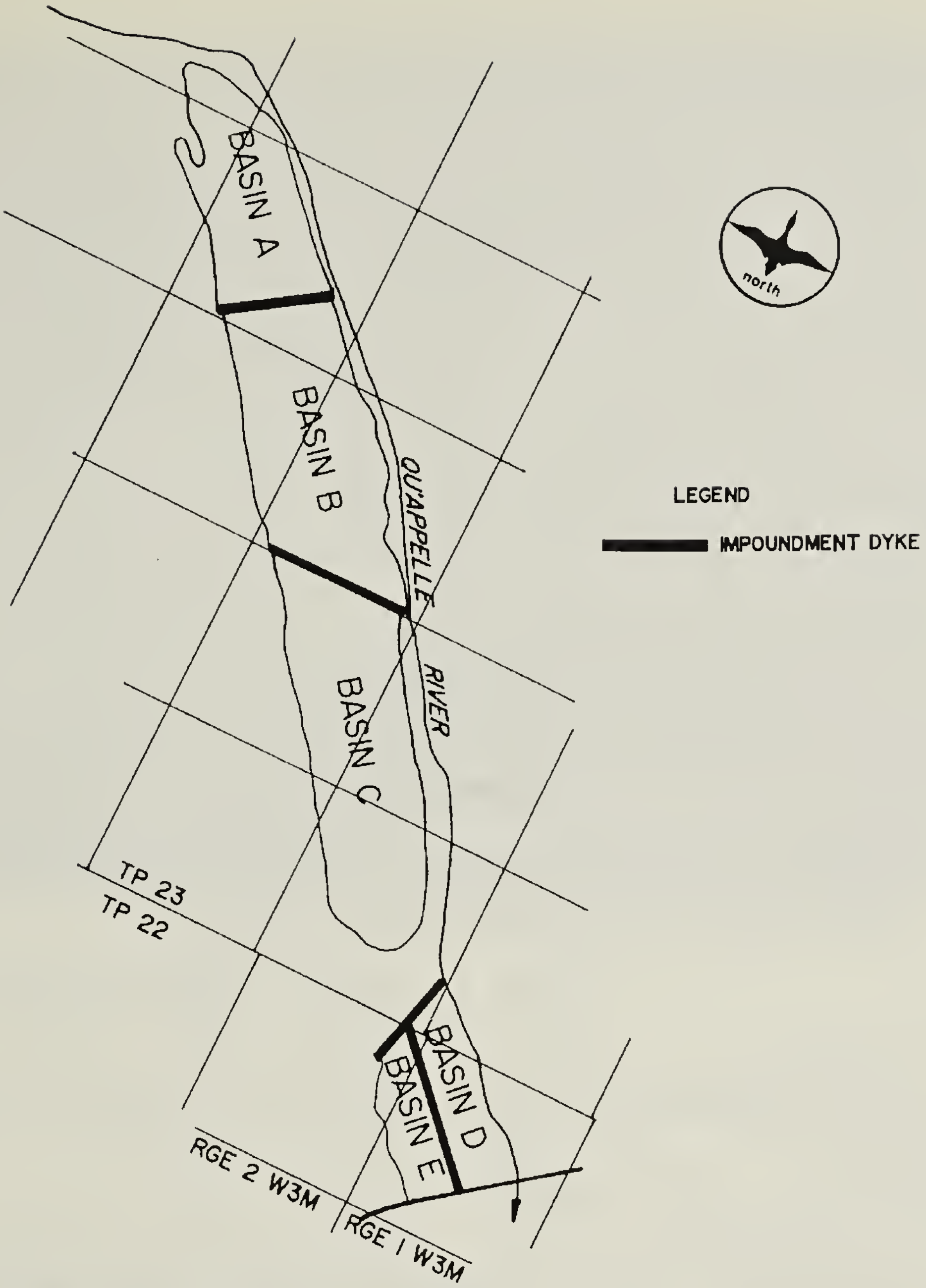


Figure 1. EYEBROW LAKE SKETCH PLAN.

mid-1980s probably resulted in very low waterfowl use with little or no subsequent die-off. No records were available prior to a large outbreak in 1981.[4]

Information collected from 1988 to 1992 suggests that there is some predictability in the timing of the initial outbreak. The first observation of casualties varied from 14 to 28 July with a median date of 21 July. This coincides with the peak period of moult for many waterfowl. Outbreaks persisted from four to six weeks although the duration of the disease was likely dependent on environmental factors such as daily ambient temperature, as well as waterfowl feeding behaviour and disease management efforts.

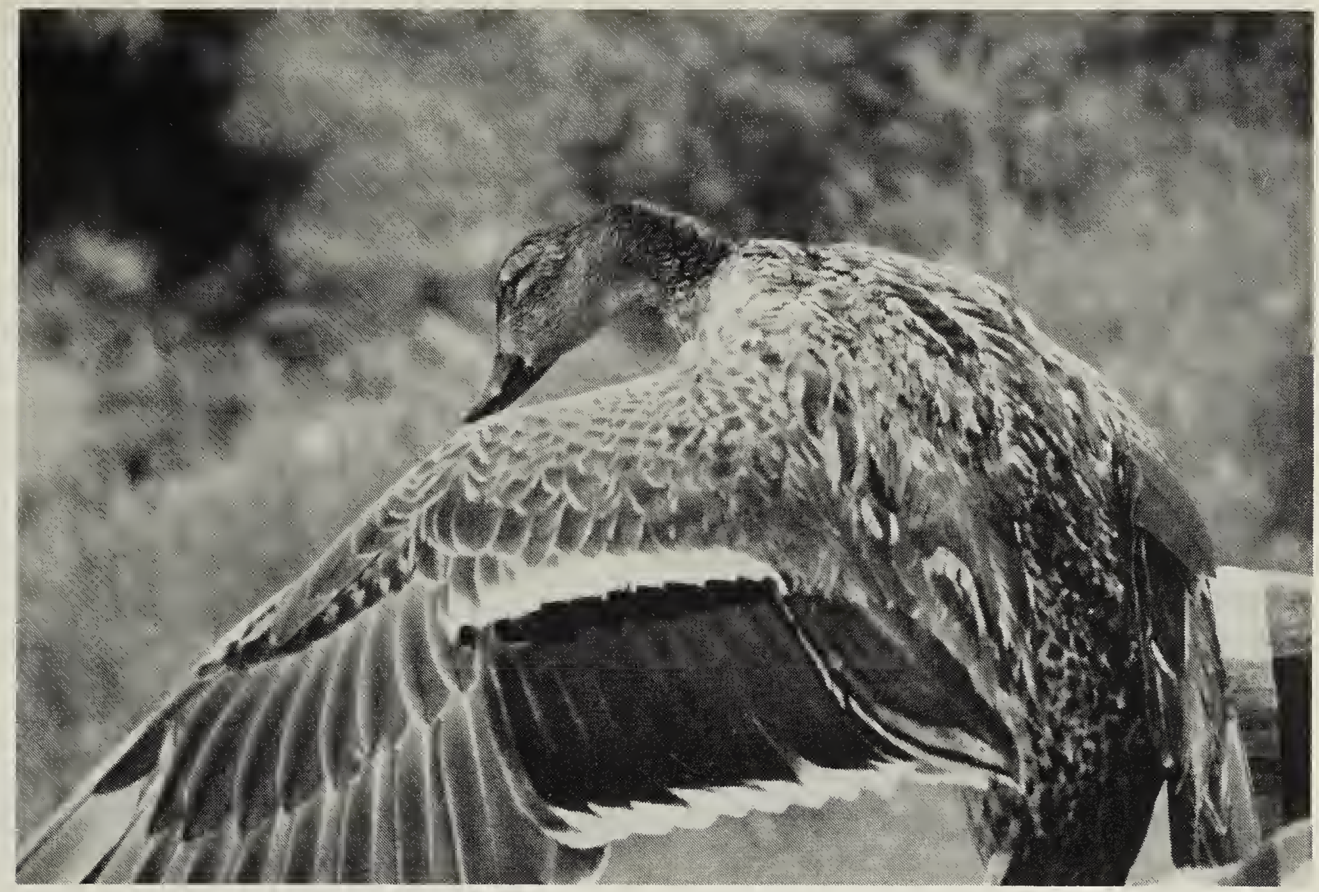
Total mortality and species composition is based on carcass removal. During the five years when significant losses were recorded it is known that the average mortality was a minimum of 3,300 waterfowl. Judging from the species composition of carcasses retrieved it appears that dabbling duck species compose 69% of mortality. Mallards consistently formed the largest portion of retrieved carcasses. Juvenile American Coots appear to contract the disease early. Botulism subsequently spreads through various other species of adult moulting ducks. The difference between the onset of moulting and foraging habitats of species may account for this progression and variation of mortality among species.

Table 1. OCCURRENCE OF AVIAN BOTULISM ON EYEBROW MARSH, 1988-1992					
	1988	**1989**	**1990**	**1991**	**1992**
Period of outbreak	20 July - 21 August	17 July - 27 August	28 July - 22 August	26 July - 14 August	14 July - 14 August
Total mortality	3,000	1,012	351	4,790	4,202
Species composition (%)					
Dabbling ducks		66	85	62	61.5
Mallard	50.0	36.2	24.0	30.0	25.4
American Coot		19.3	8.0	20.0	15.1
Blue-winged Teal		10.6	n/a	2.0	4.8
Northern Pintail		6.7	n/a	15.0	7.2
Green-winged Teal		4.4	44.0	n/a	12.0
Duckling (species not specified)		4.2	n/a	8.0	0.7
Unknown		4.9	n/a		15.6

Table 2. WATER LEVEL/TEMPERATURE VARIATIONS AT EYEBROW MARSH, 1988-1992					
	1988	**1989**	**1990**	**1991**	**1992**
Project segments with significant botulism casualties	B/C	A/B/C	B/C	B/C	B/C
Water level (M) change from operating level	-0.1/ +0.15	-0.1/ -0.1/ -0.15	+0.15/ -0.12	0/0	-0.15/ -0.2
Change from normal annual July/August temperature (°C)	+1/0	+2/+1	-1/0	0/+3	-3/-2

Specific environmental conditions are required for proliferation of the vegetative state of the bacteria following spore germination. The incidence of waterfowl botulism is more prevalent when wetlands exhibit shallow, stagnant water conditions as a result of prolonged hot weather. Managing wetland projects under a stable, high water regime should reduce the threat. Effort was made during the years of 1988 to 1992 to keep water levels high. Water level fluctuation was minimized by conveying minimal flows over the season at a rate that would offset evapotranspirational loss. Water level information compiled from 1988 to 1992 (Table 2) indicates July/ August levels were consistently held within 0.1 to 0.2 m of the full supply level. Continual flow from the Qu'Appelle River into the project basins resulted in improved water quality within the marsh.

Average monthly temperatures obtained for July and August of each year (1981 to 1992) are listed in Table 2. There was no indication that severe outbreaks coincided with unseasonably hot weather, however, it was revealed that regionally the average monthly ambient temperatures for the months of July and August are 26.1 and 25.2°C, respectively. Locke and Friend report that optimal growth of the bacteria occurs at about 25°C. It would appear that, at least in localized areas of Eyebrow Marsh, anaerobic substrate may reach this temperature by the third week of July. A more certain conclusion is that lessening water level fluctuations has not significantly



Moulting Mallard affected by botulism *Lyle Saigeon*

reduced the frequency of occurrence or the overall mortality on Eyebrow Marsh.

Other possible contributing factors linked to avian botulism include the presence of rotting vegetation and abundant invertebrate hosts. Portions of the marsh are very densely vegetated with Hardstem Bulrush. This provides good invertebrate habitat and adds substantially to the decaying detritus on the marsh bottom.

A final observation is that the presence of waterfowl carcasses rapidly escalates the spread of the disease. Floating carcasses are quickly infested with maggots and create banquets of toxic invertebrates. Other waterfowl eating the maggots from these carcasses ingest large amounts of toxin, and are frequently found dead near by the original carcass. Immediate removal of carcasses is of paramount importance.

Chiplef placed tagged carcasses randomly throughout the marsh in order to estimate the efficiency of carcass removal.[1] Retrieved tags indicated that removal efficiency of actual carcasses was 32%. Tagged carcasses represented a small proportion of the actual carcasses and the evaluation was limited to two occasions. The efficiency of the removal should increase over time as efforts continue until most carcasses appear to have been picked up. Carcasses remain afloat for a period of days and the chance of repeatedly overlooking carcasses should diminish with each effort.

Eyebrow Marsh's trend of avian botulism will continue as many of the contributing factors are beyond the scope of wetland management. Many of the casualties are Mallards. Dabbling ducks make up the greatest percentage of mortality. Water level manipulation may aid in the prevention of an outbreak but it is not reliable as a management tool. Preventative measures require regular and thorough survey for carcasses commencing with a period of high numbers of flightless moulters and high daily ambient temperatures. Effective control of an outbreak necessitates the immediate and continual removal and disposal of carcasses until the disease has subsided. Initial casualties can be submitted to the Canadian Cooperative Wildlife Health Centre in Saskatoon for confirmation of the disease. Understanding the annual recruitment and loss of waterfowl over the long term would assist in determining whether current marsh management practices should change.

1. CHIPLEF, D. 1989. Evaluation of carcass collection and disposal as a management technique for responding to disease outbreaks in wild waterfowl. Alta. Rec., Parks and Wildlife Found. Proj., unpubl. report. 13 pp.
2. HUNTER, B.F. and W.E. CLARK. 1971. Waterfowl botulism management. Wildlife Management leaflet No. 14, Res. Agency of California, Dept. of Fish and Game. Sacramento, CA., 12 pp.
3. LOCKE, N.L. and M. FRIEND. 1987. Avian botulism. Pp. 83-93 *in* M. Friend, Field guide to wildlife diseases. U.S. Dept. of Interior, Res. Publ. 167, Washington, DC.
4. SMITH-WINDSOR, T.B. and D.A. DUFFUS. 1981. Botulism monitoring and clean-up in Saskatchewan. Ducks Unlimited Can., unpubl. report, Regina. 21 pp.
5. WOBESER, G.A., S. MARSDEN and R.J. MACFARLANE. 1986. Occurrence of toxigenic *Clostridum botulinum* type C in the soil of Saskatchewan wetlands. Unpubl. report, Dept. of Pathology, WCVM, Saskatoon. 16 pp.

A cardinal, whistling spring to thaw but later finding himself mistaken, can retrieve his error by resuming his winter silence. A chipmunk, emerging for a sunbath but finding a blizzard, has only to go back to bed. But a migrating goose, staking two hundred miles of black night on the chance of finding a hole in the lake, has no easy chance for retreat. His arrival carries the conviction of a prophet who has burned his bridges. *Aldo Leopold. 1949. A Sand County Almanac. Oxford.*

THE GOPHER-CROW FIGHT

KEITH BARR, 40 Richardson Crescent, Regina, Saskatchewan. S4S 4J3

One summer while in the industrial part of the city I notice a crow standing on the ground. There are also several gophers (ground squirrels) of different sizes gathered around the crow. The gophers seem rather annoyed with the crow.

I notice that there seems to be a confrontation between the crow and a certain half-grown gopher. They are facing each other, about a foot apart. The young gopher would lunge at the crow who would jump back. The crow would advance on the gopher but it would hold its ground and scream insults at the crow. The other gophers would move toward the crow one at a time, but if the crow moved they would scamper back to their holes. Even a large gopher, which I take to be the young gopher's mother, retreats. The standoff between the crow and the young gopher lasts three or four minutes. The crow attacks the gopher several times by pecking the gopher on the head and jumping back. The young gopher is still as defiant as ever and gives no ground. After one attack, I see that the gopher is hurt. The crow attacks again. The fight is over. The crow is the victor.

I have seen crows eat mice by swallowing them whole but did not know that they could kill a half-grown gopher.

- *Keith Barr*, 40 Richardson Crescent, Regina, Saskatchewan. S4S 4J3

Richardson's Ground Squirrels *J. Asai*

RAMBLINGS ON VS SCIENTIFIC STUDY

KEITH BARR, 40 Richardson Crescent, Regina, Saskatchewan. S4S 4J3

This is not a scientific study or project to determine anything, it is only the ramblings on of an old man.

In the fall, I started to feed the magpies in Wascana Park, to see if I could get close enough to get a good picture of one ... or wait, to get a picture of the raven that was in the park at this time? I can't remember now. No matter, the raven left before I got a good picture of it and the magpies got most of the tidbits with which I tried to entice the raven.

The tidbits were animal fat that I had cut into small cubes. I got the fat from the local butcher. I told him I wanted it for the birds. I'm not sure he believed me; he most likely thought that I was for the birds!

As is our habit, my wife and I walk around the park almost every morning. During our walk I would drop tidbits when I knew the birds were watching. They were soon coming to within 20 ft. of us. I'm not sure if the magpies actually ate any of my offerings or not. I never actually saw them eat any of it. They would pick the tidbit up and fly away to a bush or a tree and hide it under some leaves or in a notch of a tree, then return for seconds, thirds and more until my morning supply ran out.

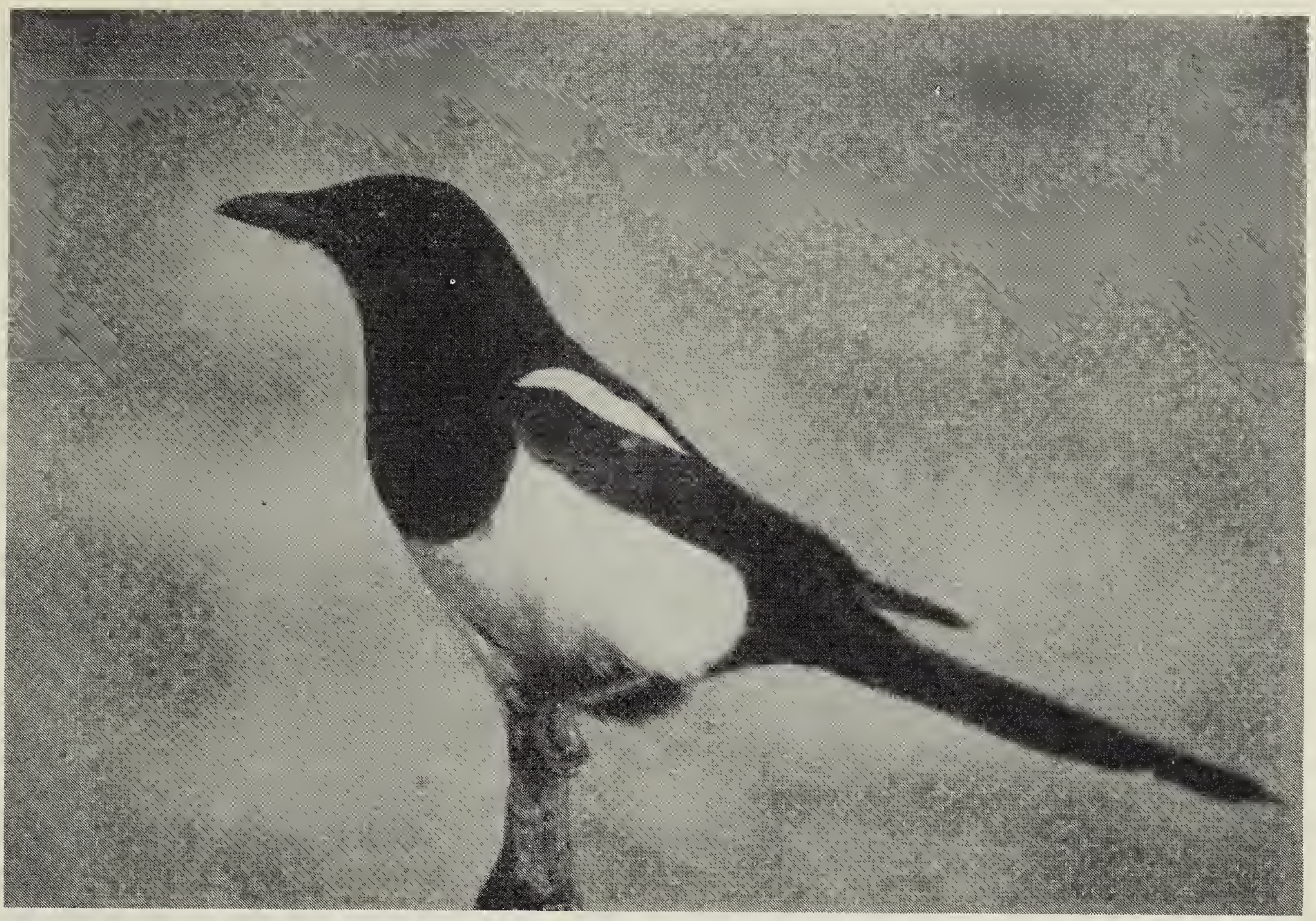
Like most winters, the snow came, and when I dropped the tidbits they disappeared in the snow. The birds would scatter the snow with their beaks until they found the treat. Now that the snow has covered the leaves, the magpies are hiding their food in the snow. They are even hiding it in the snow on top of the spruce boughs.

I wonder, do the birds remember where they hid all this food? I know if I want to remember something, I have to make a note of it, but I never remember to do this. I'm quite sure they don't remember where every piece is hidden. Woodpeckers, nuthatches and chickadees must find a lot of their stashes in the trees, while I'm sure mice and voles find the ones on the ground. I never realized I was feeding so many birds and animals.

When the snow got deeper I would place the tidbits on a branch of a tree. The magpies would hop from branch to branch until they were close enough to reach it. Some birds would grab the tidbit and be gone. Others would take the tidbit and remain in the same spot as if daring me to try and take it away from them. Some magpies would come for the handout even if I was only 18 in. away. Some are quite bold, while others are very skittish.

I was not able to convince the birds to meet us at the same place and time everyday, or was it that I slept in too often and I was the one that could not be trained? Whatever the reason, this feeding site did not last long.

All through the winter I carried food for the birds, but with little success.



Black-billed Magpie *Lorne Scott*

Sure, sometimes I was able to coax a magpie to come fairly close, but most of the time I would have to drop the tidbit and walk some distance away before the bird would come and pick it up. A lot of the time we would not even see a magpie or, if we did, it was at a distance.

In March, in an area where the magpies had been indifferent to us for most of the winter, I started to offer them tidbits and one followed for some distance as I kept offering it tidbits. The next day when we arrived at this area, there were three or four magpies willing to accept our offerings if we would walk about 20 ft. away after dropping it on the ground. This went on for a few days. Then one day when we returned, there were four magpies about 200 ft. away. They seemed to be squabbling among themselves. On catching sight of us, they flew straight to where we were.

It had snowed the night before so I cleared off a picnic table and placed the tidbits on the table. The magpies would now allow us to come within 5 ft. of them. I was curious to see how smart these birds were. I put a couple of tidbits on the table and covered each with a leaf. The magpies would fly in, pick off the leaf and take the tidbit, hop to the second leaf, drop the first tidbit, remove the second leaf, pick up the tidbit, then the first and fly off. The magpie is an opportunist. He will take as much as he can get in his beak and is very adept at holding three or four pieces at one time.

We all know the weather in Saskatchewan can change from one extreme to another. Along with this we change our clothing to suit the weather. The magpies still recognized us no matter what we wore, or did they? Would they have come to anyone who happened along at this time? Who knows?

The following day the magpies met

me about 200 ft. from the feeding area. They followed me to the picnic table. I tried to place leaves over the food again, but the wind kept blowing the leaves away, so no tricks today.

The next day, on returning to the picnic table, there were three magpies waiting for us. I covered the tidbits with a leaf again. Two of the birds would remove the leaf and get the tidbit. The third bird sat in a tree about 10 ft. away and watched the other birds uncover the food and take it. I even uncovered the tidbits and showed this bird what was there and then covered them again. No response (I think it was out of sight, out of mind). I then placed a tidbit on the table and left it uncovered. This bird came and took the uncovered piece but did not investigate the covered ones. On leaving the picnic table, one of the birds followed us. I saw an old paper cup with the bottom missing. I placed a tidbit on the ground and covered it with the paper cup. The magpie pushed the cup aside and was rewarded with the food.

Another day, arriving at the picnic table there are no birds in sight. We wait a minute or two and, sure enough, here comes a magpie. Which one, I have no idea; they all look alike to me. WHOA! I just said that I cannot tell one magpie from another, yet a few paragraphs back I was telling you that the magpies recognized me, even when I wore different clothing. Does this mean that the magpies are smarter then I am? Oh well, I have never said that I was as smart as Einstein. I put a few tidbits as well as an unshelled peanut on the table. The magpie takes the peanut and flies a short distance away and is able to open the shell and get the nuts inside.

Why did the magpie take the peanut? Because it was different? Or did he know what it was? He had no problem getting it open and eating the nuts inside. I have often fed unshelled peanuts to chickadees, nuthatches and Blue Jays. What I do not understand is how do these birds know what peanuts are and that they are good to eat. We do not grow peanuts or any other crop that resembles peanuts. These birds do not migrate anywhere, least of all to Georgia, where peanuts grow, so how do they know what they are? As this is an unscientific study that has reached no conclusions, I guess I will never know.

Somewhere in his writings, Thoreau set down that the human ear is not keen enough to catch the first footfalls of returning Spring. Perhaps so. Or perhaps Spring never quite goes away and is always with us to some slight degree. Who knows the first instant when the buds begin to swell on the trees or the very moment when the Skunk Cabbage first wriggles its hooked nose and starts to push up through the debris of the frozen ground? *John Keiran. 1947. A cup of sky. Houghton Mifflin, Boston (Krutch & Eriksson. 1962. A treasury of birdlore. Eriksson, NY. P. 25)*

THREE YEARS OF MISTNETTING BIRDS IN THE EASTERN QU'APPELLE VALLEY

JOHN POLLOCK, Box 353, Whitewood, SASKATCHEWAN. S0G 5C0

During the summer of 1992, 1993 and 1994 I operated a Monitoring Avian Productivity and Survivorship (MAPS) station in a coulee in the Qu'Appelle Valley near Whitewood. MAPS is an international cooperative bird monitoring program that began in 1989. MAPS was created to closely monitor bird populations (primarily songbirds) by netting birds throughout the breeding season. The study's main objective is to determine the species composition within specific habitat types and to determine their productivity (the ratio of young successfully fledged to adult birds) and survivorship (the ratio of birds returning to breed from year to year). With concerns about declining songbird populations, MAPS aims to determine if these declines are a result of poor productivity on the breeding grounds, changing climatic conditions or loss of habitat on the wintering grounds. There are approximately 300 MAPS stations in United States and Canada at this time.

Yellow-breasted Chat *John Pollack*

Table 1. BIRDS OCCURRING IN OR ADJACENT TO STUDY AREA IN 1992, 1993 AND/OR 1994

Breeding in Study Area	Occurred in Study Area and known to breed in adjacent habitat	Other birds occurring in Study Area (insufficient data to determine breeding)
Ruffed Grouse	American Bittern	Common Loon
Alder Flycatcher (10)	Canada Goose	Pileated Woodpecker
Least Flycatcher (22)	Mallard	Eastern Wood-Pewee
Eastern Kingbird	Sharp-shinned Hawk	Great-crested Flycatcher
Black-capped Chickadee (14)	Red-tailed Hawk	Common Raven
Veery (19)	Killdeer	Tennessee Warbler (11)
Gray Catbird (4)	Marbled Godwit	Nashville Warbler (4)
Cedar Waxwing (2)	Common Snipe	Wilson's Warbler (3)
Red-eyed Vireo (32)	Black-billed Cuckoo (1)	Canada Warbler (2)
Orange-crowned Warbler (10)	Mourning Dove	Yellow-breasted Chat (1)
Yellow Warbler (11)	Ruby-throated Hummingbird	
Black-and-white Warbler (14)	Yellow-bellied Sapsucker	
American Redstart (38)	Hairy Woodpecker (1)	
Ovenbird (12)	Eastern Phoebe	
Northern Waterthrush (18)	Western Kingbird	
Mourning Warbler (7)	Tree Swallow	
Common Yellowthroat (45)	Cliff Swallow	
Rose-breasted Grosbeak (11)	Blue Jay (2)	
Song Sparrow (3)	American Crow	
Brown-headed Cowbird (2)	White-breasted Nuthatch (1) House Wren (2) American Robin Brown Thrasher Warbling Vireo Chestnut-sided Warbler (13) Rufous-sided Towhee Clay-colored Sparrow (2) Red-winged Blackbird Northern Oriole American Goldfinch	

Brackets indicate number banded if any.

Methods Location is one of the most important considerations to make when setting up a station. A location with a good variety of birds is needed. Many bird species live in the eastern Qu'Appelle Valley. They include Ruffed Grouse, Blue Jay, Tennessee Warbler, Nashville Warbler, American Redstart, Northern Waterthrush, Ovenbird, Mourning Warbler, Chestnut-sided Warbler, Veery, Black-and-white Warbler, Canada Warbler, Rose-breasted Grosbeak and Pileated Woodpecker. In the eastern portion of the Qu'Appelle Valley, these birds find habitat that is similar to parkland habitat found further north. When birding out of the valley, these species can be difficult to find. That is why I chose the Qu'Appelle Valley.

The particular coulee I net in is quite large. There is a small creek flowing through it with numerous beaver dams and springs along the coulee. In the study area the canopy is mainly Balsam Poplar with Manitoba Maple, Green Ash and some Trembling Aspen. Heavy underbrush consists of Red-Osier Dogwood, Highbush Cranberry and Beaked Hazelnut. It is an undisturbed site with an abundance of other wildlife such

Rose-breasted Grosbeak *John Pollack*

as American Black Bear, White-tailed Deer, Coyote, Red Squirrel, Beaver and Least Chipmunk being the most noticeable. The Qu'Appelle River is about 800 m north and grain fields, grassy areas, and marshy areas are all within 200 m of the study area.

I mistnetted on eight occasions, once every ten days between 31 May and 18 August (each year). I use eight nets that have 30 mm mesh and are 12 m x 2.6 m in size. The nets are located in a 5 ha study area at fixed locations. Since I am only concerned with resident birds I do not band during migration. All birds caught are banded. Banding enables me to keep track of the number of individuals in the area by giving each bird its own number. Thus individuals aren't counted more than once and banding birds enables me to determine the number of birds returning from the previous year. I also conduct three-point count censuses each year to identify birds missed by netting. Information from all the MAPS stations is compiled to determine regional population indices, productivity and survivorship of key species.

Since species composition is linked to habitat, vegetation composition and growth are monitored each year to detect forest succession.

Results Table 1 is a list of birds that occurred in or near the study area during 1992, 1993 and/or 1994. Species are considered breeding in the study area based on the following criteria: males singing on territory over a period of at least 20 days (between 6 June-20 July), locally hatched birds observed, birds observed feeding young, and/or birds observed on or building a nest.

Red-eyed Vireo caught in mistnet *John Pollack*

Discussion Although all of these species have been recorded in the Qu'Appelle Valley, I was impressed at the concentration of species in a small area. The heavily wooded coulee habitat on the south side of the valley where there are flowing springs and creeks is extremely productive. Although often inconvenient to get to and full of all kinds of biting insects, these coulees are full of pleasant surprises.

Manley Callin (in *Birds of Qu'Appelle*) has recorded all of the above species as common to uncommon breeders in the Qu'Appelle Valley with a few exceptions.[1] Callin records the chat as a rare breeder this far east in the Qu'Appelle Valley. The Mourning Warbler and Canada Warbler are also considered by Callin as rare breeders. Callin considers the Common Raven, Tennessee Warbler, Nashville Warbler, Wilson's Warbler and Pileated Woodpecker as transient birds.

In 1994 at least one pair of ravens were present in the valley all summer and may have been breeding. Also territorial singing in early July suggests the Tennessee Warbler may be breeding in the area.

By studying local populations of bird species, information to develop keys for aging and sexing songbirds is obtained. As an example, wing chords have limited use for sexing most songbirds. I have found, however, that within the Qu'Appelle study area Red-eyed Vireo wing chords are useful for sexing with very little overlap between the sexes. Keys for aging and sexing songbirds are often inadequate and information from MAPS studies can provide information on plumage, eye colour and bill colour that will be helpful in developing regional keys.

At this time it is impossible to determine any local population trends. Perhaps after ten years significant trends might begin to show in the data. On an international basis, however, sufficient data has been collected to show significant trends with some species. This information is available from The Institute For Bird Populations and published in their journal, *Bird Trends.*

This station in the Qu'Appelle Valley is the only MAPS site in Saskatchewan and one of a handful in western Canada. I find the MAPS site rewarding as it allows me to make a detailed study of local bird populations and their habitat and to contribute to an international bird population monitoring program.

A MAPS station would be ideal for natural history groups to run. It allows for hands-on experience, uses local expertise in flora and fauna and allows for a meaningful research activity.

Acknowledgments Thank you to the Baille Bird-a-thon for their financial assistance, Canadian Wildlife Service and to Al Smith for technical assistance. More information regarding MAPS can be obtained from The Institute For Bird Populations, Box 1346, Point Reyes Station, California 94956-1346, or contact me at my above address.

1. CALLIN, E.M. 1980. Birds of the Qu'Appelle: 1857-1979. Special publ. No. 13, Sask. Natural History Society, Regina.

The water which softens as it circulates through each cell has already been down every river and slept in every ocean. The blood of the land is the river of the body. *F. Lehrman. 1988. The sacred landscape. Celestial Arts, Berkeley, CA.*

SNOWY OWL PREDATION ON A NORTHERN POCKET GOPHER: EVIDENCE OF NOCTURNAL FORAGING?

TERRY M. BREEN-SMITH and PAUL C. JAMES, Royal Saskatchewan Museum,
2340 Albert Street, Regina, Saskatchewan. S4P 3V7

The Snowy Owl is described as one of the most diurnal of all owl species.[11] Such behaviour can be attributed to its breeding range north of the Arctic Circle where, during summer, daylight is continuous and its main prey is the lemming.[5] Although it breeds at higher latitudes, the owl spends most of its lifetime wintering in southern Canada and the northern United States where it is a more catholic hunter.[1,2,3] In southern Saskatchewan, Snowy Owls can be seen from early winter in most years when the first snow falls, but during the winter of 1993-94 they were sighted as early as mid-October, well before the first snow. Many of the first owls that were sighted were immature but these are often the ones to migrate first.[6] Last year's early migration has been attributed to an apparent crash in the number of lemmings during the Arctic summer. During October and November several dead Snowy Owls were submitted to the Royal Saskatchewan Museum in Regina, and a larger number of injured ones to the Western College of Veterinary Medicine in Saskatoon. Many of these were very thin and weak (personal observations).

An immature male owl, aged and sexed using Josephson's criteria, was handed to the museum on Wednesday, 27 October 1993.[7] It was found dead on a roadside near Balgonie, 18 km east of Regina. The bird only weighed 887g which is very low; males usually average about 1,642g (range 1,320-2,013g).[4] Like the others that had been submitted to the museum, this bird had a severely protruding sternum with no overlying musculature indicating that the bird had been starving. It had obviously been killed quickly (from external examination its neck appeared to be fractured) because in its claws was evidence of its last foray, a Northern Pocket Gopher weighing 137g, 15% of the bird's mass. The owl was killed with its prey well before the first of the permanent snow which started on 1 November.

Northern Pocket Gophers have been described as being strictly nocturnal and very rarely seen above ground, except for exceedingly unusual circumstances, and because of this they are "rarely the victims of predators."[9,10,12] This is not to say that pocket gophers are not eaten by owls. For example, a Great Grey Owl broke through the thin roof of a digging gopher's tunnel and caught the inhabitant and later returned to catch three more that were attempting to plug the hole.[12]

The Snowy Owl's main prey in the winter on the prairie provinces where Northern Pocket Gophers exist, are

White Footed Deer Mice, Meadow Voles and, to a lesser extent, Richardson's Ground Squirrels.[3] Northern Pocket Gophers have rarely if ever been recorded in the diet of Snowy Owls.

To conclude, we believe that Snowy Owls may hunt at night more often than previously thought. It is possible that they need to do so during the colder, shorter days of winter in order to obtain enough to eat.

1. CAMPBELL, R.W. and MACCOLL, M.D. 1978. Winter foods of Snowy Owls in southwestern British Colombia. *J. Wildl. Manage.* 42:190-92.
2. BIRD, C.D. 1972. The Snowy Owl in the Calgary area, 1964-72. *Calgary Field Naturalist* 3:128-30.
3. BOXALL, P.C. and LEIN, M.R. 1982. Feeding ecology of Snowy Owls (*Nyctea scandiaca*) wintering in southern Alberta. *Arctic* 35:282-90.
4. EARHART, C. and JOHNSON, N.K. 1970. Size dimorphism and food habits of North American owls. *Condor* 72:251-64.
5. GABRIELSON, I.N. and LINCOLN, F.C. 1959. Birds of Alaska. Stackpole Co., Harrisburg, PA, and Wild. Manage. Inst., Washington, DC.
6. JOHNSGARD, P.A. 1988. North American Owls. Smithsonian Institution.
7. JOSEPHSON, B. 1980. Aging and sexing Snowy Owls. *J. Field. Ornith.* 51:149-60.
8. KARALUS, K.E. and ECKERT, A.W. 1974. The owls of North America. Doubleday & Company Inc. New York.
9. KOONZ, W.H. 1993. Northern Pocket Gophers above ground in winter. *Blue Jay* 51:124-25.
10. LEE, D.S. 1980. The pocket gopher mound probe. *Natural History* 80(6): 36-41.
11. PARMELEE, D.F. 1992. Snowy Owl. *In*: The birds of North America, No.10 (A. Poole, P. Stettenheim and F. Gill, Eds). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
12. TRYON, C.A. Jr. 1943. The Great Grey Owl as a predator on pocket gophers. *Wils. Bull.* 55:130-31.
13. WRIGLEY, R.E. 1986. Mammals in North America. Hyperion Press. Winnipeg, Manitoba.

* * *

A Pectoral Sandpiper, banded east of Saskatoon on 20 September 1961, was recovered in Yakutia, Russia, on 28 May 1963. In its lifetime it had probably migrated from eastern Russia through the Prairie Provinces to South America and back — at least twice. *Houston & Martinez. 1969. Bird-Banding 40:146.*

CONFESSION

KEITH BARR, 40 Richardson Crescent, Regina, Saskatchewan. S4S 4J3

I like to read and look at pictures and magazines that deal with nature. I have seen photos of animals trapped in the mud that are near exhaustion and no attempt has been made by the photographer to aid the animal in any way. Then in the next issue there is always criticism about not helping the animal, followed by the next issue, defending the photographer's actions as letting nature take its course. I don't want any criticism or defense about some actions of mine that took place several years ago. The way it happened is the way it happened and that is that.

Three friends and I drive into Pasquia Hills to go back-packing along the Rue River. I like to consider myself an amateur wildlife photographer (heavy accent on the "amateur"). We take my station wagon, as I knew we would be spending the first night at a campsite. I have brought a 4-in. foam mattress with me so I can sleep in the back of the station wagon. Four inches of foam is much softer than the half-inch insulate pad that I will have to sleep on the following nights. My three friends set up their tents and turn in for the night. I nestle down on my 4-in. foam and am soon fast asleep.

I AWAKEN! I don't know why. The moon is full and it is quite bright

Black Bear *Frank A. Switzer*

outside. I look around and low and behold, about 2 ft. away from the back window is a bear standing up on his hind legs looking in at me. My first reaction is to kick the back door. The bear moves off about 5 ft. and stands up again. My second reaction is to grab my camera and take a picture of the bear. The bear moves off. I look all around to see if I can see him. I see nothing and hear nothing for a minute or two. Then from one of the tents, "Get the hell out of here!" Then I hear bushes rustle and some kind of large animal departs the scene. I keep looking from the safety of the car for the next half hour in hopes of getting more pictures. However, the bear does not return and I go back to sleep.

I never warned my friends who were sleeping in the tents that a bear was about. I was too interested in getting pictures. I guess I am like the photographer who never helped the animal in the mud. I never told my friends about our big visitor until the morning. You know, I haven't seen two of my friends since we got back from backpacking, which was some 15 years ago. Some people sure do hold a grudge for a long time!

- *Keith Barr*, 40 Richardson Crescent, Regina, Saskatchewan. S4S 4J3

A CLOSE ENCOUNTER OF THREE KINDS

KEITH BARR, 40 Richardson Crescent, Regina, Saskatchewan. S4S 4J3

I know that the title does not sound quite right but that's the way it is.

My first encounter was several years ago in the Pasquia Hills. It is the long weekend in May. A group of us had backpacked into the hills and get back to the car earlier than planned. We decide to do a little bit of Sunday driving to see some of the area by car. We have not gone very far when out of the corner of my eye something catches my attention. I look and see a young Moose calf in the tall grass. We stop the car, get out and approach the area where I had seen the animal. The noise that we make walking through the tall dry grass must be frightening to the calf. We get to the area and find it lying as flat as possible. We keep advancing toward it until we have surrounded it. Still the calf does not move or twitch an ear. Everyone takes several pictures. We stay in the area for close to five minutes taking pictures and still the calf does not move. We go back to the car. We are lucky to see a Moose calf and get pictures. Our encounter could have been much different had the mother shown up!

The second encounter was a few years ago in the Coalfield Community Pasture. I am taking part in a bird survey. The first thing I see is a Coyote hightailing across the pasture. I start to wander across the field, watching for birds. Away in the distance I see some kind of small animal moving about in the tall grass by a large rock. I can't tell for sure what it is, as I only get a glimpse of it now and then through the tall grass. I meander towards this large rock, looking now and then to see if the small animal is still in the area. I notice another object between the rock and myself. I cannot tell if it is vegetable, animal or mineral. It might just be some disturbed grass, part of a dead animal or some wind-blown man-made material. I saunter to within 100 ft. of this object and see that it is a ragged old fur of some kind, and I still see the small animal again playing around the rock. It might be a young fox.

I start to walk towards the rock. All of a sudden the old piece of fur comes to life! Up comes the head, looking at me. It jumps to its feet and gives a bark, turns and runs toward the rock. At the sound of the bark I see three small animals scoot a short distance from the rock and disappear.

The fur is a Coyote that has been sleeping a short distance from its den. A brisk wind is blowing towards me, therefore the Coyote has not got wind of me. The rustling grass had prevented the Coyote from hearing my approach till I was about 40 ft. away. The small animals are Coyote pups and they disappear into the den. The Coyote ran till it was out of sight. Even if I had had my camera with me, I would have been too dumbfounded to use it. So ends the second encounter.

Now for the third encounter. I was in Prince Albert National Park in late March with a small group of people. We had parked the car in a small turnoff by the Waskesiu River. On returning from a hike along the river I notice a Red Fox sitting at the edge of the road, across from the car. We walk slowly towards the car, not wanting to scare the fox. We get to the car and I take my camera out. The fox is still there. Amazingly enough, it gets up and trots across the road towards us. What sort of fox is this? Is it rabid? No. Just accustomed to people. The fox walks around us and among us without fear. I toss it a few unshelled peanuts which it eats. I take a couple of pictures, we get into the car and drive away. We look back at the fox. It is looking at us, as if to say, "Hey, you forgot me."

So I have had a close encounter with three kinds of animals.

On extinction: "Often, the fact that a species of butterfly is close to extinction can be seen as a symptom that an entire unique habitat is about to be destroyed. The collapse of many of the earth's ecosystems may result in a world hostile, at best, to humans." *Jeffrey Glassberg, Butterflying Through Binoculars.*

REHABILITATED RED FOXES AND COYOTES

TERRY and RANDY LANGELIER, Box 306, Blumenort, Manitoba. R0A 0C0

As members of the Manitoba Wildlife Rehabilitation Organization (MWRO), we have rehabilitated orphaned Red Foxes and Coyotes for release into the wild during the fall, for the last couple of years. We receive the animals after they have been weaned from the bottle and have been started on solid food by other MWRO members who specialize in infant fox and Coyote care. The releases are termed "slow," because the animals have the doors to their runs left open, and may leave at will. Food (dead rats, mice and rabbits) is left out on a continuing basis, and is slowly cut off in late fall to encourage hunting. Foxes are released at least a month earlier than Coyotes; final shots for rabies, distemper, and mange hopefully give them a slight advantage over their wild counterparts.

Our property east of Steinbach is completely surrounded by poplar bush. Land use in the area is mixed farming. There are more hay fields and pastures intermingled with bush than there are open fields with grain. This benefits our slow release program since there is habitat to support these kinds of animals, which move out and establish territories of their own. Fortunately, our 5-acre yard is well treed, and the runs for the foxes and Coyotes are far enough apart that they cannot see each other, although they can probably detect each other's scent. In 1992, we

Red Fox pups *G.W. Beyersbergen*

Coyote *Wayne Lynch*

released seven foxes, and in early September 1993 we released 11 uneventfully.

The release of the Coyotes occurs in October. We had two animals from different localities in Manitoba come to us in late spring. They were a male and female of similar age. They remained with us through the summer, and had their diet switched over to mainly mice, rabbits, rats, and whatever road-kills we could obtain that they might naturally encounter as prey in the wild, including small birds, ground squirrels, and deer. We had been advised that the male, the more aggressive of the two, would probably run off as soon as he was allowed, not to be seen again, and that the female would likely hang around for a while. Just prior to release, the female hurt her leg. We decided to release the male anyway to give him time to adapt to the surroundings before permanent snowfall. When he stuck around and would not leave the female, we suspected that being social animals they had bonded. Once she stopped limping, the female remained in the run, not attempting to leave, even though the male went in and out to visit her at will. This lasted for four days, but eventually she departed.

At this point, we got a call from our nearest neighbours, asking if we had released some wolves this year. This was not surprising, since the animals were developing their thick winter coats, and these people had never seen Coyotes in their yard before. Unfortunately, having not been raised in a proper family group, these Coyotes seemed to have no fear of buildings, although they did have a healthy fear of people; you could watch them from inside the house, but not approach them. We observed them together on a couple of occasions, but then the female disappeared. There is a wild population of Coyotes in our area, and we wondered how they might have interacted with her.

Meanwhile, the male hung around. We started putting dead animals out for him on a less regular basis, hoping to force him abroad in search of food. He staked out our bird feeder, which had a variety of birds visiting it. There were Common Redpolls, Blue Jays, Black-capped Chickadees, Pine Grosbeaks, and White-breasted Nuthatches in regular attendance. On 23 October, in broad daylight at about 10:00 a.m., we observed the male Coyote grab a nuthatch from the side of a poplar trunk; he then trotted off and crunched it up, leaving some wing feathers and the head. The Coyote was unbelievably quick about the snatch. The birds were usually pretty wary of him, so it was quite surprising. The next time I observed him hunting was in early December; he was after mice or voles under a few inches of snow, near the trees. He looked robust and quite healthy but shortly thereafter he left us. We have not seen him since. We suspect that the local Coyotes finally ran him off, since their howling chorus had been getting closer to the yard during those nights.

Rare birds: Of the 9,600-odd species of birds on Earth, 1,400 are listed as endangered. The rarest bird in the world is perhaps the Echo parakeet of Mauritius; one breeding pair was reported in 1993. (Several rarer species are known from single sightings, writes author Russell Ash, but must be assumed to be extinct in the absence of records of breeding pairs.) *Bird-watching. The Globe and Mail, 8 March 1994.*

POETRY

JEAN MACKENZIE, 1014 - 7th Street East, Saskatoon, Saskatchewan. S7H 0Y8

MARIGOLD HEAD

Like a yellow flower
burst into bloom
on the slender stalk
of a green cattail
near the centre
of the prairie slough

Marsh marigold head
into black-petalled eyes
belonging
to a coal-black body
startlingly decorated
with white wing patches

Voice as violent
as the arresting colours —
low hoarse croaking call
song with low rasping notes
ending in the long descending buzz
of the Yellowheaded Blackbird.

CLEVER JILL

"Wheeoo! Wheeoo!"
Gray Jay
how did you get your nickname
of "Whisky Jack"?
Did you act
so friendly and tame
that one gray
boring day
someone invented a game
of making you frisky
by pouring you whisky?
And did your mate
have enough brain
to stay away
so that she would not receive the
name
of "Whisky Jill"?

Gray Jay *Wayne Lynch*

NATURE LIBRARY

WINGS OVER THE PRAIRIE

Essays by H. ALBERT HOCHBAUM. Compiled and edited by GEORGE HOCHBAUM. Photography by JACK A. BARRIE and GLENN D. CHAMBERS. Tamos Books, Hyperion Press, Winnipeg. 1994. 116 pp. $32.95.

Al Hochbaum died on 2 March 1988 but his memory lives on in his books. His first prize-winning book, in 1944, *The Canvasback on a Prairie Marsh*, is still in print, and is a classic worth reading and rereading. Al's other books include *Travels and Traditions of Waterfowl* and *To Ride the Wind*. His expertise was recognized by the University of Regina, which in the 1950s sponsored a series of lectures by Al on how to write.

On the fiftieth anniversary of Al's first book, his son George, a wildlife biologist with the Canadian Wildlife Service in Winnipeg, has edited 13 of his father's unpublished essays, modified one other, and written a succinct three-page introduction to produce *Wings Over the Prairie*. Gene Bossenmaier, former Director of Resource Planning and Allocation for the Manitoba Department of Natural Resources, and now retired to Mayview, Saskatchewan (where he is studying the fungi in Prince Albert National Park) has provided a four-page foreword.

This is a beautiful book, the illustrations alone are worth the price. They include 22 of Al's incomparable pen-and-ink sketches, and one of his fine egg tempera paintings, "Canvasbacks against the sun." There are also 58 superb colour photographs by Barrie and Chambers, who in three pages share their expertise concerning how to take photographs of birds in flight.

The informative text, easy to read, deals with many aspects of the ecology of Canadian prairie marshes. Hochbaum shares his belief that the two greatest obstacles to protection of marshes and their wildlife are public objection and political apathy. To restore wildlife resources, our first need is an understanding of why many species are declining. Apathy, says Hochbaum, "can be overcome only by deliberate, patient demonstration and education." Universities "must bring the aesthetic and economic values of wildlife into the overall academic plan. The student of engineering, agriculture, law, or architecture whose program has included at least an orientation course in conservation ... is a better and more caring citizen." This book is an ideal present for duck hunters, anyone who loves marshes, and those interested in nature photography.

Reviewed by *C. Stuart Houston*, 863 University Drive, Saskatoon, Saskatchewan. S7N 0J8

SHADOWBIRDS — A QUEST FOR RAILS

WILLIAM BURT. 1994. Lyons and Burford, New York. 161 pp., hard cover.

I like the book *Shadowbirds* very much. It is a book of 161 pages packed with delightful reading and remarkable pictures — all about trying time after time, place after place, to get pictures of rails at night. It is about many, many other topics as well, told with exceptional skill and good humour.

William Burt had the same

Virginia Rail *Wayne Lynch*

experiences with rails that I have had and he has written what I would like to have written.

In North America there are six kinds of rails. Burt writes about all of them. In Saskatchewan we might expect to see three kinds: Sora — widespread in marshes; Virginia Rail — not as common; and Yellow Rail — very, very rare and choosy about where they live.

Rails are curious characters. Unbirdlike, they are fleet on foot and clumsy in the air. They live in the thickest of marshes, where they spend their lives unseen. Rails are prowlers in places of mud and shadow, slinkers in reeds and grasses, jittery nondescripts that shrink from view and slip silently away.

William Burt has a captivating way of writing that keeps you reading. For example:

> "Eight years ago I made a try for Maryland Black rails. I brought company along, a wife and a sister-in-law; and you don't want to do that if you want to find Black rails."
>
> "Start tape player ... in seconds he is there, rapping on the speaker like a woodpecker. He backs off, climbs several inches up a nearby plant stalk, puffs out his chest feathers and growls, then dives at the machine bill-first, like a dart. He walks around the Panasonic monster, pecking it several times, loses interest and disappears."
>
> "Right at my feet a big brown bird jumped off its basketful of eggs and stood still, staring, engaging me like a warrior, with feathers all puffed out and bristling, growling its animosity."

I very much enjoyed reading *Shadowbirds* and I am happy to have the book in my nature library. I recommend that you read this charming book whether or not you have ever seen a rail.

Reviewed by *Mabel Charlton*, 501 McGillivray Drive, Weyburn, Saskatchewan. S4H 1L9

MEMBERSHIP APPLICATION FORM

☐ New Member ☐ Renewal

Name.. Phone.......................................
Address ....
City ....Prov. .... Postal Code ....
☐ Change of Address: Please write in new address above

☐ Gift Membership:

Name.. Phone.......................................
Address ....
City ....Prov. .... Postal Code ....

Category	**One Year**	**Three Year**	**Five Year**
Individual	☐ $25	☐ $65	☐ $95
Family	☐ $30	☐ $75	☐ $115
Special (<18, >64)	☐ $20	☐ $50	☐ $75
Foreign	☐ $30	☐ $75	☐ $115
Sustaining	☐ $50		
Patron	☐ $100		
Life	☐ $600		

I wish to make a tax creditable donation to Nature Saskatchewan:

☐ Education Fund $_____
☐ Habitat Conservation Fund $_____
☐ Grasslands Trust Fund $_____
☐ Endangered Species Fund $_____
☐ Royal Sask. Museum Exhibit Fund.... $_____
☐ Last Mountain Bird Observatory........ $_____
☐ Non-specified .... $_____

A SPECIAL OFFER to join our national affiliate, the Canadian Nature Federation.

With every CNF membership purchased through Nature Saskatchewan, CNF will donate $4 to the Grasslands Trust Fund. Membership benefits include quarterly issues of the award-winning nature magazine *Nature Canada* and the conservation newsletter *Nature Alert.*

☐ Individual $30 ☐ Family $35 ☐ Send information on CNF

Fee Total
Nature Saskatchewan Membership ....$_____
Nature Saskatchewan Donation..............$_____
Canadian Nature Federation Dues..........$_____
Total ....$_____

I would like to pay by: ☐ Cheque ☐ Visa ☐ Mastercard

Cardholder's Name:____

Credit card number __/__/__/__/__/__/__/__/__/__/__/__/__/__/__/__/__/

Expiry date __/__/ __/__/ Signature _______________________________________

Make cheques and money orders payable to **Nature Saskatchewan.**

* ***Do you know*** of any person interested in natural history and conservation who does not receive the *Blue Jay*? Please send their name and address and we will send a sample *Blue Jay* and an invitation to join our Society.

Renew by Phone!
Call toll-free: 1-800-667-4668
or FAX 306-781-6021
to renew by Visa or Mastercard

THIS ORGANIZATION RECEIVES FUNDING FROM:

Saskatchewan
LOTTERIES
LOTTERY
TICKET
CENTRE

NATURE SASKATCHEWAN and BLUE JAY BOOKSHOP

BOX 4348, REGINA, SASKATCHEWAN S4P 3W6
(306) 780-9273 — in Regina
1-800-667-HOOT (4668) — elsewhere in Saskatchewan
FAX (306) 781-6021

BOARD OF DIRECTORS

OFFICERS		
Honorary President	Stuart Houston	863 University Dr., Saskatoon S7N 0J8
President	Paul James	General Delivery, Pilot Butte S0G 3Z0
Past President	Douglas A. Schmeiser	22 Simpson Cres., Saskatoon S7H 3C6
First Vice-President	Frank Scott	R.R. 3, Box 2, Group Site 317, Saskatoon S7K 3J6
Second Vice-President	Paul Chytyk	2-2022 Lorne St., Regina S4P 2M3
Treasurer	Gordon Gault	2865 Retallack St., Regina S4S 1S8
Recording Secretary	Lance Irvine	85-3rd Ave. N., Yorkton S3N 1C2
EXECUTIVE OFFICE		
Executive Director	Curt Schroeder	57 Malone Cres., Regina S4S 5J4
Administrative Assistant	Shari Martinook	1168 Angus St., Regina S4T 1Y5
Program Coordinator	Heather Dundas	4-2725 15th Ave., Regina S4T 1S5
REPRESENTATIVES AT LARGE	RESPONSIBILITY	
Rolfe Antonowitsch		Box 333, Indian Head S0G 2K0
Alan Appleby		3079 Athol St., Regina S4S 1Y6
Kathleen Donauer	Member Initiatives	11 Mowat Place, Regina S4R 3W3
Melanie Elliott	Education	4-103 Powe St., Saskatoon S7N 1W5
Barbara Hanbidge		721-2nd St. E., Saskatoon S7H 1P6
Brian Hepworth		3609-28th Ave., Regina S4S 5Z2
Robert Kreba		5-3823 Retallack St., Regina S4S 3B7
Paula O'Neil		16 Sheffield, Regina S4S 2Z7
Lloyd Saul	CNF Representative	Box 154, Semans S0A 3S0
Karyn Scalise		2641 Grant Rd., Regina S4S 5E8
Randy Schmidt		518 Wathaman Cres., Saskatoon S7K 4P9
Lorran Wild		48 Wesley Road, Regina S4S 5P4
APPOINTED DIRECTORS		
Blue Jay Bookshop	Jim Elliott	2258 Rae St., Regina S4T 2E9
Blue Jay Editor	J. Lynn Brown	209-27th St. W., Saskatoon S7L 0J4
Blue Jay News Editor	John Pollock	Box 353, Whitewood S0G 5C0
Conservation	Frank Switzer	1301 Shannon Rd., Regina S4S 5K9
Species & Spaces	Andy Didiuk	314 Egbert Ave., Saskatoon S7N 1X2
Fund Development	VACANT	
Special Publications	Mary Gilliland	902 University Dr., Saskatoon S7N 0K1
Membership	Paul Chytyk	2-2022 Lorne St., Regina S4P 2M3
Tour Director	Stanley Shadick	304-1008 Temperance St., Saskatoon S7N 0N6
PRESIDENTS OF LOCAL CLUBS		
Phyllis Bordass	Fort Qu'Appelle Naturalists	Box 313 S0G 1S0
David Gehl	Indian Head Natural History Society	Box 1177 S0G 2K0
Phil Curry	Melfort Natural History Society	Box 1115 S0E 1A0
Al Gurnsey	Nature Moose Jaw	Box 2042 S6H 7T2
Bill Klassen	Nature Prince Albert	Box 291 S6V 5R5
Jim Elliott	Regina Natural History Society	2258 Rae St., S4T 2E9
Garth Nelson	Saskatoon Nature Society Inc.	529 Dalhousie S7H 3S5
Ray Belanger	Weyburn Natural History Society	Box 411 S4H 2K3
Warren Hjertaas	Yorkton Natural History Society	510 Circlebrooke Dr. S3N 2Y3

-
12/31/1996
Library - Acquis. - Serials
EDMONTON, AB
T6G 2J8

NATURE
SASKATCHEWAN

Public Sales Agreement No. 0431095.
Postage paid at Regina.
Please return unclaimed copies.
Return postage guaranteed.

Box 4348, Regina, Saskatchewan.
S4P 3W6

Acid Free/Recycled Paper

University of Alberta Library

0 1620 0984 8217